*Next Meeting, The American Association of Orthodontists, San Francisco, California, May 8 through 12, 1955. Headquarters, The Fairmount Hotel.*

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American Journal
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VOL. 40 SEPTEMBER, 1954 No. 9

# Original Articles

## PRESIDENT'S ADDRESS, SOUTHWESTERN SOCIETY OF ORTHODONTISTS

CLARENCE W. KOCH, D.D.S., LITTLE ROCK, ARK.

IT IS somewhat difficult, following as I do so many distinguished predecessors in office, to present something new and novel for the good of the Society. Those who preceded me have so efficiently performed their duties that the official year, just closing, has presented no unusual problems or headaches. I am truly grateful to them for having removed the stumps from the road.

I am grateful also to the vice-president, Bill Pugh, Chairman of the Program Committee; the secretary, Fred Boyd; and the various other committee members for their indispensable assistance in preparing the scientific program and the social features of this meeting. Space precludes mentioning the names of all who have contributed their help, but I do want to mention the names of W. R. Alstadt, Forrest E. Dunaway, and W. L. Casey, for they have been the local wheel horses. Thermon Smith, unfortunately, was stricken with a heart attack or he, too, would have energetically put his shoulder to the wheel. For whatever benefit you derive from the scientific discussions and for whatever enjoyment you may experience from the social functions, give your thanks to these gentlemen who did the work.

My gratitude also to Dr. Andrew Jackson and Dr. Carl Zeisse for appearing on our program. It is wholesomely refreshing in this grasping, selfish era that busy, outstanding men of the profession put aside their own pecuniary interests and come to us, motivated only by the noble desire to stimulate us to greater usefulness in our daily work. This interest that the leaders of our profession so routinely bestow on the rest of us is a valuable privilege—a privilege

Presented before the Southwestern Society of Orthodontists, Nov. 2, 1953.

we should always assume with a sense of obligation to render a like service to others in the profession, to the extent of our capabilities. As the poet, Markham, so aptly puts it:

> "There is a destiny that makes us brothers
> None goes his way alone,
> All that we send into the lives of others
> Comes back into our own."

So long as such principles and practices are followed, you may be sure the science and art of orthodontics will travel toward ever-ascending achievements.

It would be difficult to visualize what the practice of orthodontics would be without meetings such as this. The picture definitely would not be pleasant to contemplate. However, at times we are almost engulfed by meetings, and the wag may have expressed a good point when he said, "It probably would be better if some of them were laid end to end." Therefore, a matter that could well be given consideration, not only by this Society, but probably by all associations and societies affiliated with dentistry, is the timing or spacing of meetings. As you know, three major orthodontic meetings are in progress this very day—the Southern Society at Orlando, Florida; the Tweed Group at Chicago; and our meeting here. Doubtless, it was a coincidence that these meetings were all scheduled on the same dates; nevertheless, I am sure everyone would agree that the spacing of a proper time interval between these meetings would have been better. In our Society, there are men who were most anxious to attend the Southern meeting, but felt their allegiance belonged first to the Southwestern—so they are here. We also have members who are not present here today, because of their obligation to attend the Tweed meeting in Chicago.

Clinicians devote much valuable time and go to a vast amount of trouble to prepare papers. They consider this time well spent or they look upon it as a sacrifice, depending on the size and attentiveness of the audience. No little effort is expended by the members of various committees in planning, organizing, and doing the necessary leg work to launch a meeting. A good attendance makes of it a labor of love, while a poor attendance is acutely disappointing, to say the least.

The expense of our annual meetings is no small item, either, and it seems wasteful unless a representative attendance is present. Social features must be planned far in advance of the meeting on the basis of average attendance of previous years. When the attendance does not measure up to the average, a financial loss to the Society is almost a certainty. We depend on funds from advertisers and exhibitors to help defray the cost of our meetings. At Houston we had thirteen exhibitors and four pages of advertising. At San Antonio there were seven exhibitors and three pages of advertising. At this meeting, we have three exhibitors and two and one-half pages of advertising. I am sure

that factors other than the simultaneity of the three meetings played a part in the matter; yet, exhibitors find it not to their liking to exhibit at three places at the same time.

It is, of course, the privilege of societies to hold their meetings when they please, but their mutual interests would be better served if their meeting dates could be better coordinated. I recommend, therefore, that our director on the Board of Directors of the American Association of Orthodontists present this matter to the Board as a whole at their next meeting in Chicago. If this Board could serve as a clearing point, or else create a central committee, where sectional meetings that might conflict with each other could be scheduled two or three years in advance, it would prevent a recurrence of a situation such as exists today.

I would now like to discuss advertisers and exhibitors. I have noticed in the past few years, and our program booklets will show this, that there is an increasing reluctance on the part of orthodontic supply houses and manufacturers to accept the advertising facilities we have to offer. This seems to be the experience of the Southern Society also. I quote from their recent bulletin: "Each year, it is becoming more and more difficult to interest the various manufacturers to exhibit at our convention." To be sure, we have a company or two who, with faithful regularity, exhibit and advertise annually, but let us face it—they do this more as a gesture of good will than for any financial gain. This does not seem like a good situation. It is a fallacy to believe that the manufacturers can give something without first taking something away. An orthodontic society does not need handouts to help defray the expense of its meetings. A step in the right direction was taken by our Board of Directors, when they voted to discontinue the practice of soliciting golf and gun-shoot prizes from our suppliers. We should now go a step further. We should arrange our finances so that we need not depend on these outside sources for additional revenue. This does not mean that exhibitors should be excluded from our meetings. On the contrary, they should be cordially invited and informed of the charge for space. But the invitation should be extended more in the nature of offering them the opportunity to exhibit, with assurance that, should they see fit not to do so, no loss of good will would result. I am sure this loss of good will has never been even vaguely implied in our past solicitations; yet, I fear that some of our suppliers have this impression.

All of this may sound as if I were in the employ of the exhibitors, but my only interest and appeal is to place this matter on a plane that befits the professional character of this Society. Of course, this will result in the loss of some income. For this and other reasons, which will be briefly referred to later, it may become necessary, in time, that our dues be increased. There is, however, no urgency about this matter. Ample time should be taken to approach the proposition thoughtfully and with courteous and prudent deliberation.

The other alternative is to cut our pattern down to the size of our cloth; however, no organization, business or professional, can operate efficiently

without adequate finances. Opinions would quite naturally vary as to what constitutes adequate financing. These opinions would be influenced largely by the objectives sought. Certainly, the funds available should not be of such amounts as to offer temptation to wreckless extravagance in expenditures, or to create large reserves, but neither should there be any need for penny pinching in the operation of this Society.

So long as we maintain the present scale of operation, the funds seem ample enough, but it is a recognized principle that no organization long maintains a status quo position—it will either progress or it will retrogress. We should, therefore, see to it that our Society continues to grow in membership and in its sphere of influence. The yardstick of our programs should be "how good can we make them," not "how much can we afford to spend for them." Tempered by good judgment, the expense should be the secondary consideration. The same applies to our social program. If saving money is to be the objective, the best way to achieve this would be to eliminate meetings altogether. As ridiculous as this would be, frugality is equally so, especially when we consider that our portion of these expenses, as members, is deductible from our income tax.

If the scientific programs are comprehensively informative, if the social programs are delightfully enjoyable, and if the food and accessories are alluringly delectable, these are sure to be conducive toward a mellow and cordial feeling between the members. With such hearty geniality pervading the meeting, could it not perhaps check the splintering tendency of the membership into factions because of the various philosophies of diagnosis and treatment methods? It could perhaps bring about the consummation of Dr. Dan Peavy's wish, expressed in his presidential address last year: "You treat cases your way and I'll treat cases my way, but let's walk along together." I would like to add to this: "Let's have a little fun on the journey."

A more detailed report on the subject of finances has been made to your Board of Directors. They will decide whether or not further consideration is advisable. Our fine new constitution and bylaws prescribes definite methods of procedure, and rest assured they will be faithfully adhered to.

I wish now to submit to you, briefly, the objectives I offer for consideration, and which may require additional finances:

1. The employment of an assistant for the secretary of this organization. This assistant would be required to devote one-half of her working day, or its equivalent, to attending to the clerical details of this Society, under the direction of our elected secretary. On first thought, it might appear that this is more time than would be required to administer the Society's affairs. This may be true for the present, but in the plan the secretary's office would perform additional services, such as mailing the programs and mimeographing and mailing occasional letters to the entire membership, work up a quarterly bulletin perhaps, and perform other duties for the Society that time and experience may indicate as practical additions.

The secretary's office is the focal point of any Society. It is a clearing house for all information. He keeps the records, he answers the correspondence, he collects the dues, and he pays the bills. This, and many other items too numerous to mention, makes it an arduous, never-ending task. Orthodontists are busy people and many times their secretarial duties interfere with their professional activities and vice versa. True, the secretary accepts this duty of his own volition because he is willing to render a service to this Society; nevertheless, he should not be expected to perform all the routine details of the office. His duty should be to see that the policies established by the Society are carried out, leaving to an assistant the execution of the details. Obviously, a comprehensive survey should be made by a competent committee before there is any reorganization of the secretary's office.

2. To have sufficient finances to bring outstanding clinicians to our meetings, no matter from what part of this country they might come. At present, it is a strain on the budget when clinicians are selected who live far removed from the place of our meeting. Our program committee should not be placed in the position of the old woman who started out to bake a cake and then switched to a pie instead because she did not have enough dough.

3. To carry on our meetings without dependence on advertisers or exhibitors for income.

These, my fellow members, are my recommendations—the product of the past few years' experience and observation. What your final action will be is important only to the welfare of our Society. My hope, as stated previously, is that we will approach the matter thoughtfully and with courteous and prudent deliberation so that, in the end, whatever decision is reached will be of permanent benefit to the Society.

In closing, I want to tell you I appreciate deeply the honor you have conferred upon me. It is a great experience. To be sure, the step-by-step ascent to the presidency imposes many somewhat arduous and time-consuming duties, but they are fully compensated for by the many friends you make along the way. I will ever cherish both—the honor and the friends.

May good fortune smile on you and peace be with you always.

# ORTHODONTICS IN PUBLIC HEALTH PRACTICE

HARRY STRUSSER, D.D.S., M.S.P.H., F.A.C.D., F.A.P.H.A.,† AND
LOUIS A. SIMON, D.D.S., M.P.H., F.A.P.H.A.,* NEW YORK, N. Y.

*REMEMBER THE CHILD*

*Who builds an empire does a lesser thing*
*Than he who leads a little child to health;*
*The hands of him whose care and knowledge bring*
*Beauty and happiness achieve a wealth*
*Far greater than kings of industry*
*Whose names are written high in bank or mart;*
*He is the sculptor of true destiny*
*Who shapes the clay of body, mind and heart.*

*Practitioners and teachers, near and far,*
*You hold within your hands the heritage*
*Of races yet unborn, to make or mar;*
*Hold high the trust, the precious tutelage,*
*Remembering there is no nobler plan*
*In serving God than serving child and man.*
*Anderson M. Scruggs, D.D.S., F.A.C.D.*

OF THE many and varied services available to the physically handicapped child in the City of New York, one of the most dramatic and gratifying is the Oral Rehabilitation Program. This includes orthodontic, prosthetic, and endodontic care and is a joint venture of the Bureaus of Dentistry and Handicapped Children.

## AUTHORITY

This care for the physically handicapped child is provided through state legislative action. The Domestic Relations Court Act of the City of New York and the Education Fund as amended on April 16, 1945, transferred the services from the Special Term of the Children's Court to the City Department of Health (New York State Laws of 1945, Chapter 780 and Title A of the Administrative Code, City of New York, Section 556-18). According to this act, a physically handicapped child is anyone under 21 years of age "who by reason of a physical defect or infirmity, whether congenital or acquired by accident, injury or disease, is or may be expected to be totally or partially incapacitated for education or for remunerative occupation."

## PREVALENCE

Dental malformation often may become a serious health problem and in many instances its impact has psychological complications. These conditions

Read before the Northeastern Society of Orthodontists, New York, N. Y., March 8, 1954.
†Deceased.
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have been attracting increasing public health attention because, in addition to the many varied effects to individual health, the number and various types of complications have increased continuously. A survey at the Guggenheim Dental Clinic in New York City disclosed that 50 per cent of the children from 2 to 9½ years of age suffered from minor malocclusions, while 10 per cent suffered from severe malocclusions.[1] A later survey of 119,000 St. Louis school children revealed that 51 per cent had dentofacial abnormalities of varying severity.[2] The New York City vital statistics show the following congenital malformations and birth injuries (1951 data).[3]

| | |
|---|---|
| Cleft lip only, | 0.32 per 1,000 live births |
| Cleft palate only, | 0.21 per 1,000 live births |
| Cleft palate and cleft lip, | 0.17 per 1,000 live births |
| Cleft palate and other anomalies, | 0.09 per 1,000 live births |

The orthodontic problem is usually manifested in early childhood. While the causes of malocclusion may be hereditary and congenital, malnutrition, endocrine disturbances, trauma, and other factors play a part. The most frequent causes are probably premature loss of teeth, prolonged retention of deciduous teeth, and pressure habits which persist, such as mouth breathing, thumb-sucking, and tongue thrusting.

## ADMINISTRATIVE AND TECHNICAL RESPONSIBILITY

The program at the outset was jointly administered by the Bureau of Dentistry and the Division of Physically Handicapped Children, now the Bureau for Handicapped Children. As a result of experience and cooperative planning, the Bureau for Handicapped Children concerns itself with the social, medical, and financial phases of this enterprise, while the Bureau of Dentistry promotes the technical and supervisory aspects of this activity.

The Orthodontic Advisory Committee assists the Bureau of Dentistry in this program. This group of public spirited and outstanding members, recommended by your own Society, meets with us regularly without recompense. At various times they included Drs. Joseph Eby, Lowrie Porter, Jack Salzmann, Franklin Squires, Leuman Waugh, and the late Dr. Harry Barber.

The function of this committee is (1) to advise in program planning; (2) to recommend eligibility requirements for cooperating orthodontists; (3) the examination of orthodontists who wish to be included on the roster of cooperating orthodontists; (4) to act as consultants and assist the cooperating orthodontists with their difficult cases; and (5) to study and evaluate borderline cases for service.

It can be seen that much of the activity and program planning can be attributed to their efforts.

In all program planning it is essential to have a definition of terms and criteria for *raison d'être*. Therefore, the following classification was agreed upon as meeting the philosophy of the law and the program.

1. Congenital cleft palate (with or without surgical interference).
2. Ankylosis of the temporomandibular articulation.

3. Extreme structural deformities involving growth and development of the maxilla or mandible.
   a. Prognathism
   b. Retrusion
   c. Micro- or macrodevelopment of the jaws.
4. Severe cases of malocclusion resulting from mutilation by:
   a. Disease
   b. Trauma
5. Presence of or likelihood of development of severe disfiguration or speech defect resulting from malocclusion or the loss or disease of permanent teeth, which may present a serious obstacle to normal development, education, and employment later in life.

The care of dentofacial deformities may be placed broadly in two groups: *essential* and *selective*.

An *essential rehabilitation* would naturally be one where, because of the very nature of the handicap, the health and the future of the child may be in jeopardy, while a *selective* case invariably would be one where, even though function could be improved, the problem would be chiefly one of cosmetics. It is the former with which we are concerned within the framework of this program.

## PROCEDURES FOR REFERRING CHILDREN

Children may be referred for oral rehabilitation from several sources, such as private physician, dentist, parent, public health nurse, school physician or dentist, dental hygienist, teacher or other school personnel, and other social and health agencies.

## STEPS TAKEN IN THE REFERRAL OF CHILDREN

Request for service is made through school health sources. These referrals are ultimately directed to the public health nurse in the school and arrangements are made for a medical examination by the school physician. The report of this examination is sent to the nearest Department of Health dental clinic through the Health Officer. The dentists carefully examine and screen referrals and indicate on the BD 30 (application for orthodontic care) an opinion as to whether the case should be rejected because the condition does not come within the category outlined or referred to the Bureau of Dentistry for further study. After final screening by the Bureau, the cases are:

(1) Approved—All cases falling within the accepted criteria.

(2) Rejected—Those definitely not within category for this service.

(3) Recalled—Cases may be recalled at some future time in the event a decision cannot be reached at this time.

(4) Referred—In the event that a decision is difficult to arrive at because of the nature of the handicap or poor prognosis, cases may be referred for further study by our Orthodontic Advisory Committee.

Children approved for care, as well as those referred to the Orthodontic Advisory Committee for further action, receive immediate appointments for study casts and full-mouth radiographic examination. At this time, the parents' financial ability to pay is carefully reviewed. Each applicant is required to furnish evidence to substantiate his inability to pay. The child is requested to furnish front- and lateral-view photographs of passport size.

The cases referred to the Orthodontic Advisory Committee are studied, reviewed, and are either (1) approved, (2) rejected, or (3) recalled.

### ASSIGNMENT OF SPECIALISTS

The approved cases are now ready to be assigned to specialists under the State Aid Medical Rehabilitation Program. Where dental care is indicated, the patient is referred to his private dentist. In the event that the parent cannot afford this service, this work is completed at one of our dental clinics.

### CRITERIA FOR COOPERATING SPECIALISTS

With the assistance of the Orthodontic Advisory Committee, standards have been set to establish lists for participating orthodontists. The New York City Department of Health and the New York State Department of Health exchange information and lists.

*Orthodontists' Qualifications.*—The following are eligible for enrollment as orthodontic specialists:

A. Dentists certified by the American Board of Orthodontists or who meet the requirements for certification. Board requirements include:
   1. Graduation from a recognized dental school.
   2. Five years' exclusive practice of orthodontics or equivalent. Equivalent may include:
      a. One or more years of exclusive graduate study of orthodontics in a school recognized by the American Board of Orthodontics, plus four years' exclusive practice of orthodontics.
      b. Full-time instructor in orthodontics in a recognized school.
      c. Full-time associate in the office of an orthodontist whose standing is recognized by the Board.
      d. Full-time member of the orthodontics staff of the United States services.
      e. Properly accredited appointee in orthodontics to a hospital, group, or dispensary of recognized standing devoting full time to orthodontics.

B. Active members of the Northeastern Society of Orthodontists or those eligible for membership. Requirements for membership include:
   1. Exclusive practice of orthodontics for three years.
   2. Active membership in the American Dental Association.

C. Others not meeting the requirements of the American Board of Orthodontics or the Northeastern Society of Orthodontists must submit for

review five satisfactorily completed cases including appropriate diagnostic aids (study models, x-rays, photographs), indicating progress in treatment:

1. Dentists who have completed a formal course in orthodontics at a university college of dentistry and earned a certificate or degree in orthodontics must devote at least 50 per cent of professional time to the practice of orthodontics.
2. Dentists without such formal training must devote at least 75 per cent of professional time to the practice of orthodontics.

*Endodontists' Qualifications.*—All duly licensed and practicing dentists trained in this specialty and who are willing to participate in this program are accepted.

*Prosthodontists' Qualifications.*—All duly licensed and practicing dentists trained in this specialty and who are willing to participate in this program are accepted.

### FEES

*Orthodontists.*—The program allows the maximum payment of $730.00 per case to an orthodontist in private practice and $470.00 to an orthodontic clinic in hospital payable in the following manner:

a. Orthodontists: $300.00 for the first year.
$200.00 for the second and third years.
Up to $30.00 (six visits at $5.00) for retention.

b. Orthodontic clinic or hospital:
$200.00 for the first year.
$120.00 for the second and third years.
Up to $30.00 for retention.

All payments are made on a quarterly basis following the annual authorization. These include all services and appliances needed in course of treatment.

*Endodontia.*—Fees for root canal therapy are allowed on the basis of $25.00 per tooth.

*Prosthodontics.*—All fees for restorative work are based on the Veterans Administration fee schedule. Where obturators are indicated, the fee is arranged on an individual basis. At present, the City and State Advisory Committees are considering a fee schedule for services needed by the Cleft Palate patients.

### REFERRAL FOR TREATMENT

All children are referred to cooperating orthodontists on the basis of residence in order to insure a minimum amount of travel time and avoid hardship in travel expenses. Cases are assigned by appointment and the orthodontists may reject cases for treatment.

Orthodontists commence care and submit to the Bureau of Dentistry quarterly progress reports (BD 42). In this manner close contact is kept

with each case. Difficulties and social problems are resolved by other services available either in school or health service. At or near the close of the year of treatment, and annually thereafter, children are recalled in order to ascertain progress and authorize payments for the following year.

Children who receive restorative or root canal therapy are seen when treatment is completed.

By this time it is clear that our rehabilitation program affords an opportunity to serve children with functional and physical defects. The human approach and the results obtained give us satisfaction. It provides the handicapped child or adolescent with an opportunity to become an active and self-supporting citizen assured of a position in society. Many a family has been assisted in the rehabilitation of a youngster with either an orthodontic abnormality, a cleft palate or lip, and/or both, and rehabilitation of gross abnormalities due to complete loss of masticatory efficiency and impairment of speech because of loss of dental structures.

The consequences of such a service cannot be evaluated in dollars and cents because we can never evaluate in dollars and cents the satisfaction of a child without impediment prepared to meet the trials and tribulations of a competitive society. This type of program also characterizes the enlightened nature of the community in that it chooses to direct its efforts toward the development of the potentialities of the individual, rather than setting up institutional care for the handicapped child.

The program, now in the eighth year, is carrying approximately 1,200 children. As previously mentioned, an interesting phase of this service is the development of approved standards and criteria for a more thorough and integrated service by the pediatrician, dentist, psychiatrist, social worker, prosthodontist, and speech therapist. All these services are coordinated for the rehabilitation not only of the child but also of the family, its responsibility to the community, and in turn the community's response to the family unit.

The number of children treated under the program has increased materially. The number of cooperating specialists and agencies has increased. Many interesting and different cases have been not only discovered, but successfully treated. Because of the leadership given by the New York City Department of Health in this phase of treatment for the handicapped child, many hospitals and other educational and treatment agencies are initiating similar services to meet this demand. Table I shows a year-end summary of the activities in this program.

The New York City Department of Health is responsible for the health of the infant and the preschool child, as well as approximately one million school children. In addition to the mass dental health education and service program, the Department of Health is also responsible for the care of the handicapped. This presents an opportunity for case finding of congenital defects; one of these is the cleft palate and cleft lip. The Bureau for Handicapped Children and the Bureau of Dentistry are now in the process of setting up a register to follow up all such defects. The medical rehabilitation program

TABLE I. COMPARATIVE STATISTICS, ORTHODONTIA, (1951-1953)

| | 1951 | 1952 | 1953 |
|---|---|---|---|
| *Screening Clinics* | | | |
| Approved-orthodontia | 362 | 396 | 420 |
| clinic treated | | 98 | 71 |
| prosthesis | | 16 | 7 |
| Referred to Advisory Committee | 91 | 65 | 74 |
| Recall for future screening | 257 | 272 | 339 |
| Rejected | 134 | 171 | 225 |
| Dropped | 18 | 9 | 31 |
| Total cases screened | 862 | 1027 | 1167 |
| Broken and canceled appointments | 550 | 269 | 296 |
| Total appointments made | 1412 | 1296 | 1463 |
| *Review Clinics* | | | |
| Approved for further care | 237 | 387 | 587 |
| Placed on retention | 46 | 75 | 81 |
| Completed-orthodontia | 56 | 78 | 105 |
| prosthesis | | 12 | 5 |
| Dropped | | 6 | 17 |
| Total cases reviewed | 339 | 558 | 794 |
| Broken and canceled appointments | 118 | 178 | 308 |
| Total appointments made | 457 | 736 | 1102 |
| *New Applications Received* | | | |
| Referred for screening | 774 | 851 | 853 |
| Rejected in the field | 75 | 48 | 88 |
| Recall | 47 | 51 | 48 |
| Total new applications | 896 | 950 | 989 |
| *Advisory Board Decisions* | | | |
| Accepted | 75 | 31 | 28 |
| Rejected | 49 | 13 | 23 |
| Recall | 30 | 5 | 6 |
| Total | 154 | 49 | 57 |
| *Fort Greene Clinic Treated (Preventive)* | | | |
| Completed | | 65 | 71 |
| Referred for orthodontia | | 2 | 7 |
| Dropped (uncooperative) | | 14 | 30 |
| Now under treatment | 5 | 59 | 54 |

carried out by these bureaus is concerned not only with the children with this type of deformity, but also with their families who cannot cope adequately with their problems because of financial difficulties.

In previous years, the child with cleft palate received little attention. What little attention could be obtained was mainly of a surgical nature and the quality of services varied greatly. The atmosphere and life within the disturbed families were never considered, and the child received only the services available from practitioner to specialist and from agency to agency. Speech training, one of the greatest needs, was given only in rare instances and, when given, proved inadequate because of the lack of properly trained personnel in this field and because of the expense involved.

As a natural growth of our Handicapped Children's Program, the Department of Health, with the cooperation of the Pediatric, Orthodontic, and Dental Advisory Committees set up criteria for the maintenance of cleft palate clinics in the various hospitals.

DISCIPLINES

The team approach, on an experimental basis, is advantageously bringing all the essential disciplines together. These disciplines are herein mentioned alphabetically:

| | |
|---|---|
| Dentistry | Plastic Surgery |
| Nursing | Prosthodontia |
| Oral Surgery | Psychiatry |
| Orthodontia | Psychology |
| Otolarnygology | Social Service |
| Pediatrics | Speech Therapy |

Through the team approach, both the child and the family may receive more adequate care. Diagnosis and treatment will be planned and carried throughout the years, with all the medical, dental, and social personnel participating as we know them and within the powers of the community. At present, plans are not yet complete for all services, but we can care for the child on a limited basis at present. Limited care is now available. Complete care on an experimental basis has been initiated at several cleft palate centers. One of these is at Mount Sinai, under the guidance of your president, Dr. Salzmann.

To us in the Department of Health, there can be no greater reward than seeing the progress of these children. Many show dramatic results, not only from the standpoint of correction of the orthodontic defect but also in the improvement of the mental outlook.

Here are but two of the many letters that have come to us from grateful parents.

February 16, 1953

"Dear Dr._____:

"I would like to put into words how thankful I am for the wonderful work you have done on my daughter's mouth and face.

"When _____ first went to you, her mouth and face were terribly disfigured. Her upper lip was so tight against her teeth that it curled under and the lower lip extended quite a way out beyond the top. The condition of the roof of her mouth and gums caused her teeth to grow improperly. She also had some teeth growing from the roof of her mouth. _____'s nose was flat against her face and one nostril was completely collapsed; thus, she continually breathed through her mouth.

"_____'s life was not a very happy one because of her deformity. Her school work was affected because the teachers did not understand her, classmates made fun of her, and she was always being made the target of ridicule. Her teachers suggested I transfer her to another school where she would get speech lessons but that didn't help; she would often come home crying that the children were making fun of her. This was her life before she was helped by you.

"From the day you put braces on _____'s teeth there was a remarkable change in her; my daughter has such faith in you, Doctor _____, that no matter what you ask her to do she is always willing to do it. The rubber bands you put from the top braces to the bottom to reset her jaw bones were on for a

long time; however, when you took them off it was worth all the pain and discomfort she had to go through. I think she is the happiest girl in the world; her teeth were pulled and when you took off the braces and put in her obturator she doesn't talk so much through her nose.

"The interest you showed in ------ is wonderful. You took such pains in fitting her for the braces and the obturator. ------ is a much happier girl now, she has many friends and it has made such a remarkable change in her. She is 16 years old and in a year or two she will be going out into the world. All I hope is by that time she will be ready: I pray each night that in the work you have will not be left undone. It is hard enough to get along in life without being held back by a handicap.

"I really can't put into words my thanks to you for your help. All I can say is 'thank you and may God bless you.'

Sincerely yours,
Mrs. --------"

December 2, 1952

"Dear Dr. --------:

"I have meant to drop you a line so many times to thank you for the interest you have taken in my son, -------.

"I also want to thank you from the bottom of my heart for the obturator which you have made possible for ------'s mouth.

"There are so many things that ------ can do, say, and eat now which he could never do before, such as

whistling
eating hard food
eating cereal
drinking from fountains
speaking clearly
swimming
blowing his nose

and it has lessened his sore throats. But, most of all, it has given him a new slant on life. Before he would never speak or even try to speak to strangers. If we had company he would stay in another room. He would never eat with strangers, as the food would all come out of his nostrils. Now he goes anywhere, speaks to anyone, and has also joined several activities.

"As you can see, it has made a new boy of him.

Thanking you once again,
I remain, his mother
Mrs. --------"

## CASE REPORTS

*Case 1.*—J. P., a 14-year-old boy, was born with a complete bilateral cleft of the lip and the hard and soft palates. He had numerous surgical operations for the correction of his facial and palatal deformity. His mother sought further relief for her son at the-----. The chief at the general surgical service referred him to us for orthodontic opinion. We recommended that application for assistance be made to the Bureau for Handicapped Children and the Bureau of Dentistry. His case was subsequently approved.

Examination of the boy revealed a disfigured face with an inverted, taut, and scarred, repaired upper lip; there was a severe malocclusion, distinctly characteristic of a bilateral cleft palate, with a loose premaxilla, complicated by a large persisting cleft of the hard and soft palates. The maxillary teeth were in linguoversion, bunched into left and right double rows of teeth. There were many supernumerary teeth present in the line of the premaxillary sutures, and there was evidence of inadequate dental care.

The boy's surgical history recorded closure of the bilateral cleft lip, beginning at the age of 9 days, with the closure of the first cleft of the lip and then the left cleft lip.

Plastic operation for closure of the anterior portion of the cleft started at 20 months and the history reported a modified Langenbeck; repair of the palate started at the age of 5 years.

The patient's illnesses were measles at the age of 4 years; chicken pox at 8 years; and rheumatic fever at 10 years. Shortly after the start of orthodontic care, he contracted glandular fever and pneumonia.

As for the social aspect of his problem, his speech could not be understood by his classmates and others, he had no friends, he was retiring and noncommunicative in the presence of others. He refused to eat in public places because the food would come out of his nostrils. He was unable to masticate his food unless it was specially prepared. In short, he was a very unhappy boy.

The problem of orthodontic care envisaged not only the correction of his mutilated malocclusion, but the broader view of rehabilitating this lad as a useful member of the community without further delay. The plan for treatment, therefore, provided for the

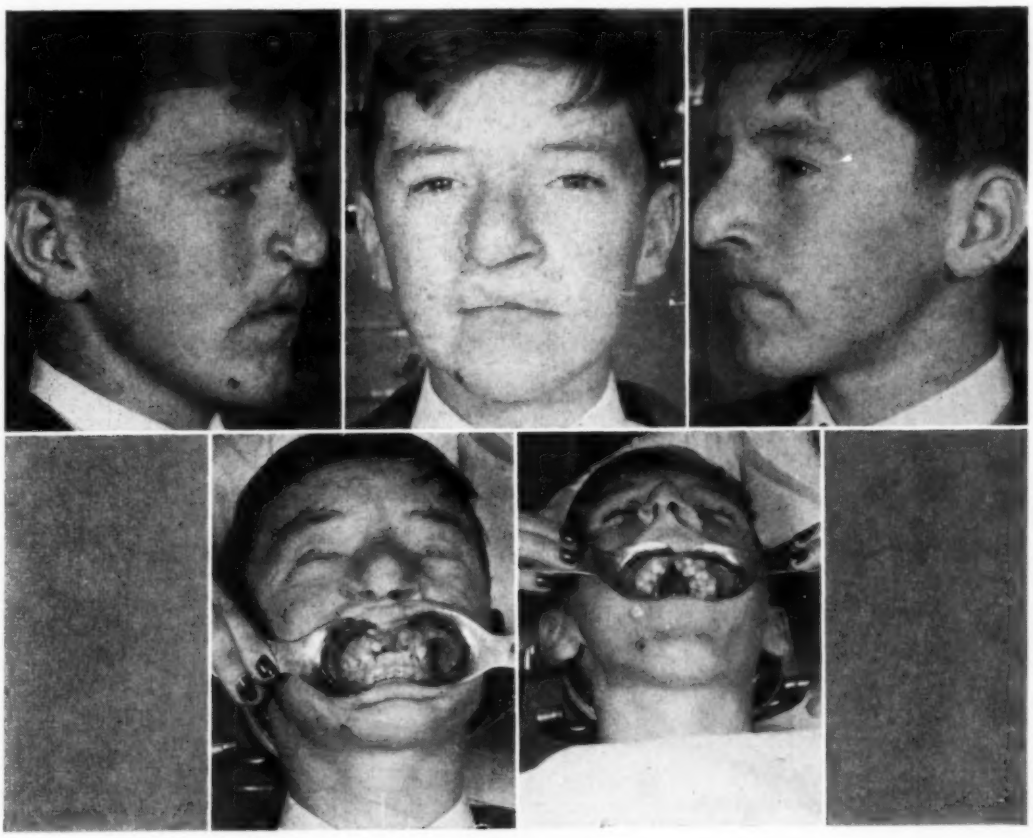

Fig. 1.—Case 1.

construction of an obturator as an integral part of the orthodontic assemblage, as is shown in Figs. 1 and 2. The reinforced anchorage enabled us to stimulate movement more effectively. Teeth were added to this obturator as improvement permitted. The additional reinforcement by the obturator appliance facilitated speech training and improved the patient's mastication.

He can now enjoy many things which he could not do before, as can best be appreciated by reading the letter received from his mother. His social outlook, appearance, speech, and occlusion are favorable. Much more will be done by plastic repair, but, all in

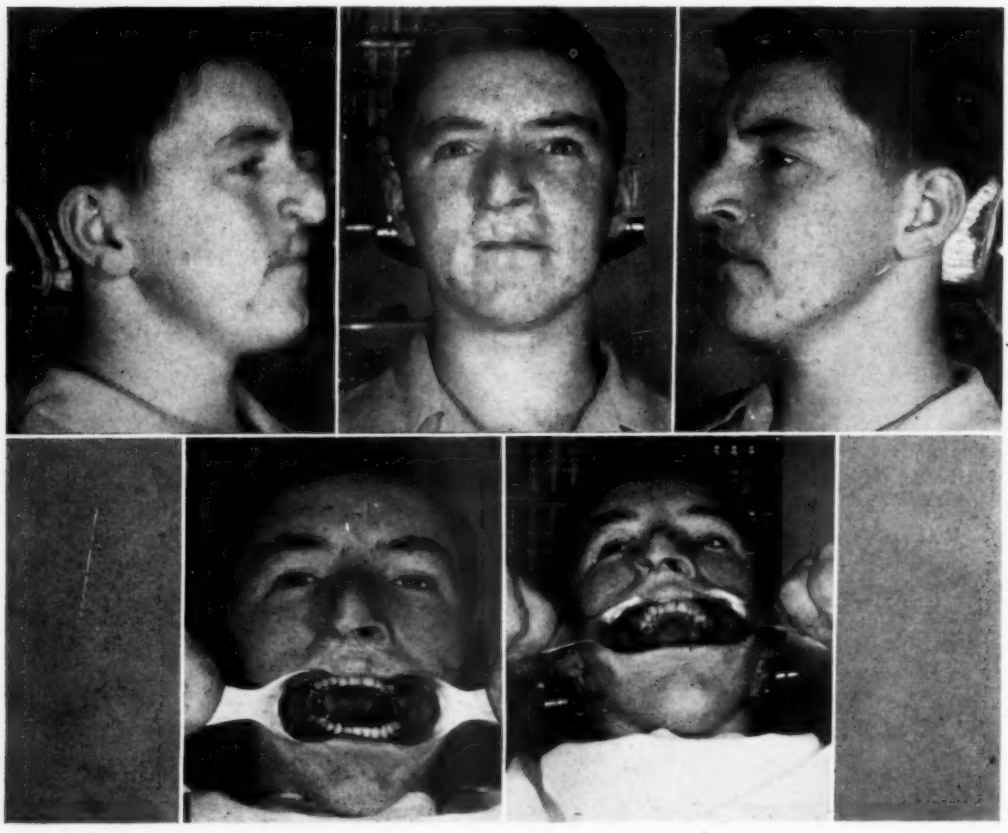

Fig. 2.—Case 1.

all, the challenge presented at the outset has in a large measure been met with much satisfaction to all concerned.

*Case 2.*—G. V., a 10-year-old girl, was born with a complete unilateral cleft of the lip and the hard and soft palates.

Surgical repairs began when she was 2 months old, with closure of the lip. According to the mother, by the time G. V. had reached the age of 6 years, there had been eight plastic surgical repair operations.

The patient's mother sought further aid at the _____ where her daughter was referred for orthodontic consultation. In cooperation with the Social Service Department, financial aid was obtained from the Division of Handicapped Children.

The child presented a disfigured face with a marked prognathic mandible (extreme mesioclusion), a taut, retruded, scarred upper repaired lip. An oral examination showed a repaired cleft of the hard and soft palates. There was a large communicating perforation of the hard palate with the nasal chamber. The hard palate terminated in a fair isthmus. There was a large bifurcation in the pharyngeal end of the inadequate soft palate. Her maxillae were contracted. The maxillary teeth were in linguoversion. The entire left alveolar segment had drifted lingually with its contained teeth in open-bite relationship to the mandibular teeth. The left canine and the right central incisor were almost in contact, the interval measuring 4 mm. This space should normally accommodate the missing central and lateral incisor teeth, thus aggravating her mesioclusion. The upper right second premolar was emerging through her gums, obviously decayed. She needed dental care. The child's medical history records her as a 7½-pound baby at birth, with measles at 3

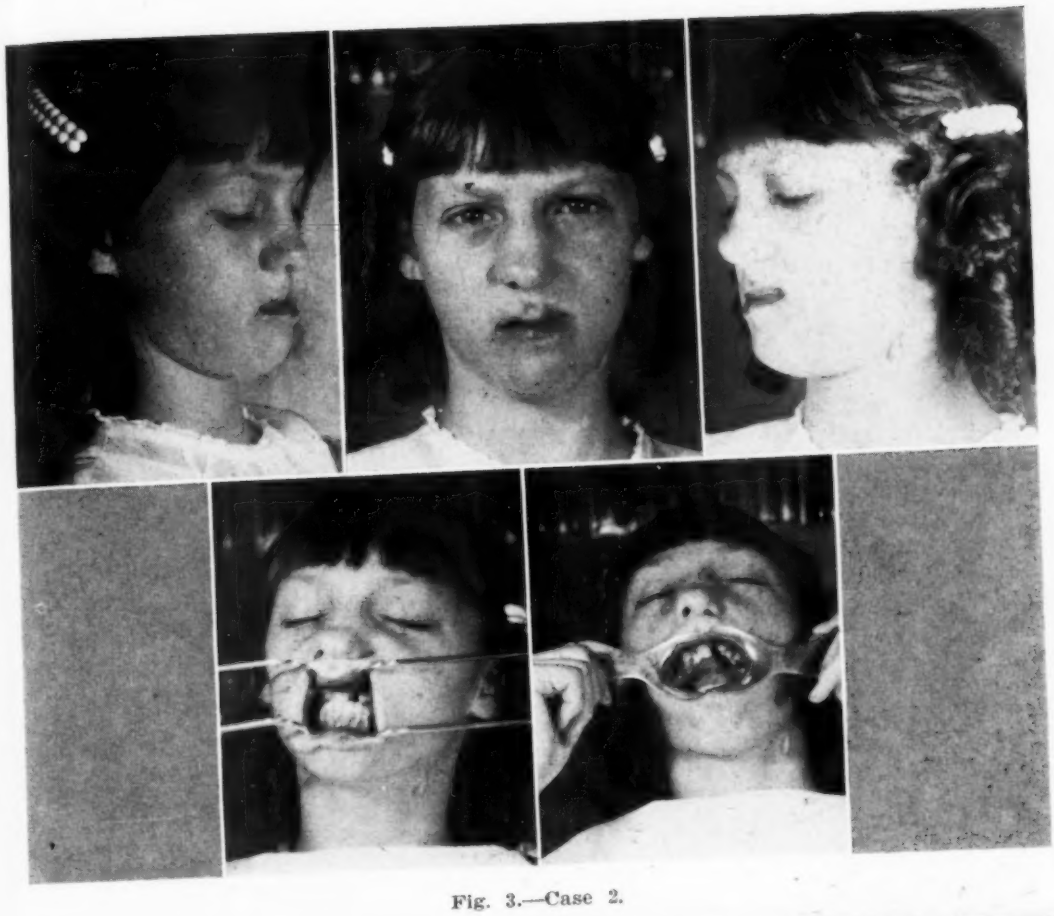

Fig. 3.—Case 2.

Fig. 4.—Case 2.

years of age; pneumonia at 4½ years of age; mumps at 5 years of age; abscesses in the throat; chronically inflamed ears; and gland abscesses on the left side of the neck.

Socially, because of the patient's deformity and speech defects, she was the subject of much humiliation. Neither her teachers nor her classmates could understand her. Her mastication was poor. The girl seemed to be a lost child, while the mother was a much disappointed woman.

Orthodontic treatment was instituted, integrating the obturator as a definite part of the orthodontic appliance planning. With this combination, as soon as sufficient space was achieved between the collapsed left and right maxillary segments, a central incisor was added to the obturator, then two teeth, and finally three teeth; the maxillary teeth were brought forward over the mandibular teeth. The open-bite was closed. This procedure permitted us to utilize, to a maximum, natural functional processes in attaining our orthodontic objective.

The patient now has a good functional occlusion, and a maximum of tooth conservation has been maintained. Her facial appearance has improved. With the additional aid of speech training, she now enunciates better. Her friends can easily understand her speech. She now appears to be a pleasant and happy young lady.

*Case 3.*—The patient, J. A., a boy, aged 11 years, with a negative history, was first seen at ---------hospital at 6 years of age. The chief complaint was absence of teeth and congenital absence of sweat glands. He had dry skin; his hair was thin and sparse; he had normal mentality. The boy seemed well adjusted. He was a habitual finger sucker.

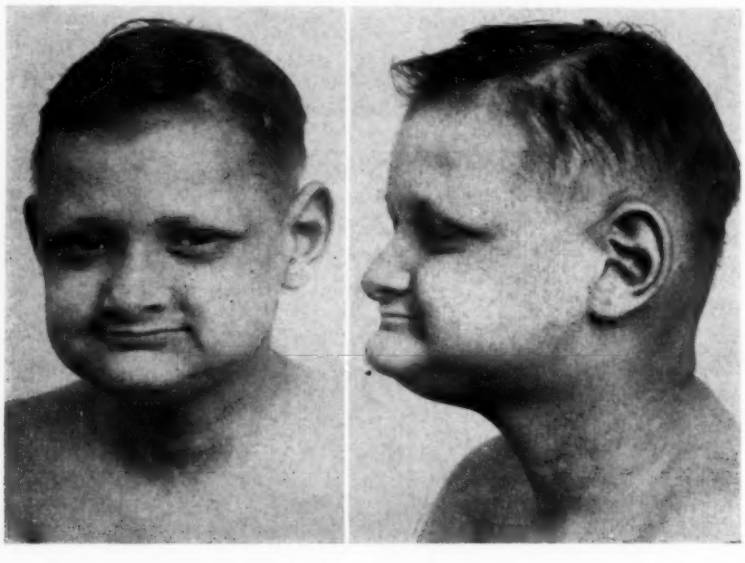

Fig. 5.—Case 3.

*Diagnosis:* Congenital etcodermal dysplasia. When first examined by the Bureau of Dentistry, the patient was completely edentulous except for the presence of what appeared to be an upper left central incisor. Radiographic examination failed to reveal any unerupted teeth or buds.

*Comments.*—Just a word on this syndrome. This condition is rather rare, but if you see one you see all. Most children so affected have the same face. This, of course, makes the diagnosis a comparatively simple problem. As mentioned before, the hair is thin and sparse, the skin is dry, and there is an absence of sweat glands. In this particular case, we are told that the mildest infectious disease will bring on a temperature of 106 degrees and over.

In spite of the absence of dental apparatus, the head, face, and arches seem normal in growth and the mucous membranes are thin but normal in color.

Fig. 6.—Case 3.

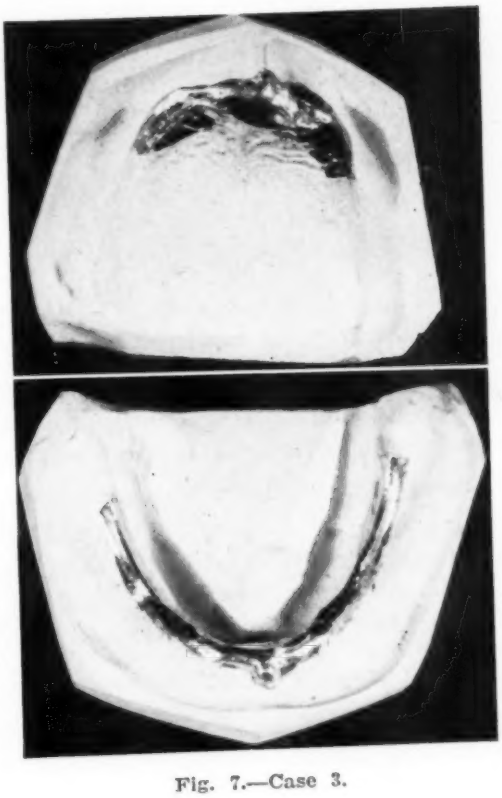

Fig. 7.—Case 3.

Fig. 8.

Fig. 9.

Figs. 8 and 9.—Case 3.

***Treatment:*** The lone central incisor was extracted and a full upper and lower denture was constructed. The child is well adjusted to this regime, his speech has improved considerably, and he is under constant supervision for any unusual symptoms.

Completed cases, similar to these that follow, number in the hundreds. Permit me to take this opportunity on behalf of the Department of Health and the grateful children to compliment our entire group for a noteworthy contribution. It was a simple matter to select several cases for presentation here. Be assured many more are available, but time does not permit their inclusion.

*Case 4.—*
Patient D. M., aged 13, male.
Application received March 13, 1951; dental work completed Oct. 20, 1951.
Assigned to one of our panel members, November, 1951.
Classification: Class II, Division 1.

*History:* Mouth breather and thumb sucker; mild speech impediment. Appliances inserted January, 1952.

*Treatment:* Johnson twin-wire technique; appliances removed April, 1953; fifteen months' active care; retention one year.

*Result:* 1. Good functional bite established.
2. Improved facial appearance.
3. Speech improved.

*Case 5.—*

Patient J. C., aged 10 years, male.
Approved for care July 13, 1949.
Referred to a panel member, Oct. 18, 1949.
Treatment completed March 21, 1951.

*Diagnosis:* Severe protraction Class II. The face was distorted by protruding anterior teeth and difficulty was experienced in closing the lips.

*History:* Essentially negative.

*Etiology:* Hereditary and pressure habits; thumb-sucking and lip biting.

*Appliances used:* Upper and lower twin arches; upper tubular lingual and lower staple lingual arches; occipital anchorage.

*Secondary treatment:* Tooth positioner for four months.

*Results achieved:* Facial and oral harmony was established; function was achieved, and the jaws are in normal anatomic and functional relationship. Treatment has materially improved the entire outlook of this patient. Treatment was completed in two years and five months.

*Case 6.*

Patient D. R., aged 12 years, female.
Approved for care April 22, 1949.
Assigned to panel member August, 1949.
Classification: Class II, Division 1.
Appliances inserted August, 1949.

*Treatment:* The length of treatment in this case was two and one-half years.
Technique employed upper and lower labials with intermaxillary elastics; no brackets, springs, or spurs were used.

*Results:* In this case the speech was improved and personality improved materially; function and appearance have greatly improved and the profile has improved.

The presentation of the preceding cases is not intended to amplify on any technique but serves to show the value of the program and the gratification derived therefrom.

## PREVENTIVE ORTHODONTICS

It is not enough within the framework of our endeavors to limit ourselves only to the problems at hand. Our responsibility extends also to the children who present such mild conditions as lingually locked anterior teeth. It follows that if a program is geared to prevent major handicaps, not only are the children aided thereby but countless thousands of dollars can be saved later.

Today in our own clinics, we have been able, with a simple acrylic splint (inclined plane) cemented to the lower teeth, to correct lingually locked upper anterior teeth. Experience has taught us to select the cases that are amenable

to this form of therapy. Efforts are constantly being utilized for the correction of other minor defects, always mindful of our limitations in such an approach (Table II).

TABLE II. PREVENTIVE ORTHODONTIA—1953

| | | |
|---|---|---|
| Completed | 71 | |
| Referred for orthodontia | 7 | |
| Dropped (uncooperative) | 30 | |
| Now under treatment | 54 | |
| Total approved | | 162 |

In conclusion, programs cannot always be evaluated in costs. In our economy, where the dignity of man is paramount, where everyone, regardless of race, creed, color, or station in life should have equal opportunities for life and contentment, the money here spent is by far the finest investment for the tax dollar (Table III).

TABLE III. COST OF CARE UNDER THE NEW YORK CITY DEPARTMENT OF HEALTH HANDICAPPED CHILDREN'S PROGRAM

| (Review examination of 53 average cases) (including cleft palate) | |
|---|---|
| Average cost | $675.00 |
| Average time treated | 2.8 years |

The rehabilitation program, as we attempt to administer it, can best be exemplified by the words of Daniel Gilman, first president of Johns Hopkins University, who said:

"By mutual cooperation and mutual aid,
Great deeds are done and great discovery made
The wise, new wisdom upon the wise bestow
Whilst the lone thinker's thoughts come slightly and slow."

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# FACTORS IN OCCLUSION

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Boston, Mass.

## INTRODUCTION

THE growth and development of the face and jaws and the emergence and alignment of the teeth in the dental arch together create the dentofacial relationships commonly called "occlusion." Obviously, those factors that regulate the growth of the face and jaws and those factors that stimulate the formation and emergence of the teeth are factors involved in the development of occlusion, but at the present time, besides agreeing that there are such factors and assenting to their importance, little has been done to evaluate their influence during various phases of growth. It is the purpose of this article to suggest how this can be done.

The traditional approach to the problem has been mensurational. Through anthropometric studies on the living, caliper measurements on plaster reproductions, and measurements on cephalometric x-ray pictures, much descriptive information has been amassed. The general pattern of dentofacial growth is now known, the magnitude of the increments at various age levels has been ascertained, and, to some extent, the shifting areas or centers of growth have been revealed, but the data, so tediously and admirably presented, is still insufficient to isolate the basic factors responsible for dentofacial growth, and far too meager to allow the weighing of these factors. Moreover, with the strictly mensurational approach it is not possible to distinguish between association and causation and, for that reason, events associated in time have been held to be causally related, thus causing further confusion.

An alternate approach to the isolation of underlying factors in dentofacial growth is through direct experimentation, largely on laboratory animals. Here, too, valuable findings have been made, and the role of muscle activity, growth-stimulating hormones, and steroid hormones has been partially explored, but such experiments have their limitations. Not only is it difficult to exterpolate findings from animal to man because of morphologic differences, but there are more fundamental hazards. The rat, so useful in experimental studies, has but one set of teeth, and these are very different in nature from ours. The cat, though possessed of two sets of teeth, responds to castration with mandibular changes not observed in the castrate human being. Factors

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in the occlusion in man, though suggested or tested by animal experimentation, must be confirmed by studies in man conducted during the period of growth and development.

Although it is impossible to conduct controlled experimental studies on growing children, either with or without the precision practicable in the laboratory, productive studies are possible when the experiments have been effected by Nature.

One has only to consider the factor, real or presumed, that requires investigation and then select, from among the many abnormalities of growth, development, or endocrine function, those conditions most likely to provide the pertinent answers. This is especially true when factors influencing dentofacial growth are under consideration.

In the present article, we have selected three factors for consideration, and have attempted to show how these three factors can be investigated. The first such factor is the *tooth factor*, which is presumed to be at least partially responsible for the growth of the jaws and the increase in the dental height. Obviously, the validity of this presumed factor can be tested by selecting individuals in whom a large number of teeth have failed to develop, and by comparing the growth of their jaws to normal individuals.

The second factor is the *growth hormone factor*. It is known that the anterior pituitary lobe produces a complex of growth-stimulating hormones that promote bodily growth and development. But does the growth hormone factor stimulate the dentofacial growth as a whole, or is there a differential effect on the teeth and jaws separately? It is evident that the effect of the growth hormone factor can be investigated in individuals where normal growth hormone production has failed.

Finally, there is a presumed *general growth factor*. In normal individuals there is a reasonably close parallelism between dentofacial growth of the organisms as a whole; this parallelism extends even to timing and sex differences. Does this indicate that the entire body, long bones, trunk, head, and face respond as a whole? Obviously, the existence of such a factor can be investigated in cases of dwarfism not of endocrine etiology.

It is the purpose of this article to show how real or presumed factors influencing dentofacial growth can be investigated, using a quasi-experimental approach, and also to present the results of such investigations.

## FACIAL GROWTH IN CONGENITAL ECTODERMAL DYSPLASIA

Congenital ectodermal dysplasia is a comparatively rare, hereditary disorder, in which ectodermal derivatives are arrested in development during the first trimester of pregnancy, and as a result, the skin and its associated structures (hair, sweat glands, and sebaceous glands) and the teeth exhibit developmental deficiencies. In some cases of congenital ectodermal dysplasia only a few teeth are missing. In others more than one-half the normal complement is lacking, and in some cases there is total anodontia. Obviously, the evaluation of the presumed tooth factor in dentofacial growth can be best carried out where the teeth are largely or totally absent in both the primary and secondary dentitions.

The present study is concerned with a mother (S. M.), edentulous as a result of extractions but with an elongated mandible, her second-born daughter (V. M.) who is a typical example of congenital ectodermal dysplasia with partial anodontia, and the first daughter (M. M.) who is normal except for a pronounced mandibular protrusion (Fig. 1).

The affected child (V. M.) was first referred for examination at the age of 2 years, 8 months, because of defective development of the fingernails and toenails and partial anodontia. Other defects were not present, skeletal (carpal) development was consistent with the chronological age, and the findings satisfied the conditions for a diagnosis of congenital ectodermal dysplasia, inherited (presumably) as a simple Mendelian recessive trait. A total of ten teeth were identified in both arches.

TABLE I. DENTAL FORMULA IN V. M. (AGED 10 YEARS, 1 MONTH)

*Primary dentition*

| -- | m | c | -- | -- | -- | -- | c | m | -- |
|---|---|---|---|---|---|---|---|---|---|
| -- | m | c | -- | 1 | 1 | -- | c | m | -- |

*Secondary dentition*

| -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | -- | M | -- | -- | -- | -- | -- | -- | -- | -- | -- | M | -- | -- |

Serial impressions of the teeth of the affected child, taken from 2 years, 10 months, to 10 years, 1 month (Fig. 2), showed a progressive increase in the size of the dental arches despite the fact that only twelve teeth had emerged (Table I). Between the second and the fifth years of life there was a slight increase in the intercanine distance and an extension of the gum pads posterior to the deciduous molars. By 10 years, 1 month, the maxillary intercanine distance had increased from 18 to 22 mm. (Table II). Similarly, there was an increase of 2.5 mm. intercanine distance of the mandible (Table II). It may be observed that the maxillary arch increased in size anteroposteriorly and the mandible showed an accelerated anteroposterior growth. Despite the absence of teeth in both maxilla and mandible, the intermaxillary space developed.

TABLE II. CHANGES IN ARCH DIMENSION IN A PATIENT WITH PARTIAL ANODONTIA (V. M.)

| AGE | | INTERCANINE WIDTH | | INTERMOLAR WIDTH | | ARCH LENGTH | |
|---|---|---|---|---|---|---|---|
| YEARS | MONTHS | MAXILLA | MANDIBLE | MAXILLA | MANDIBLE | MAXILLA | MANDIBLE |
| 2 | 10 | 18 | 14 | | | | |
| 3 | 6 | 19 | 14 | 24.5 | 25 | 23 | 16.5 |
| 4 | 0 | 19 | 14 | 24.0 | 24 | — | 16.5 |
| 5 | 1 | 19 | — | 27.5 | 25 | — | |
| 7 | 5 | 21 | 17 | 26.0 | 32 | 25 | 26.0 |
| 10 | 1 | 22 | 16.5 | 28.0 | 33 | 25 | 27.0 |

Cephalometric radiographs, taken at 10 years, 1 months, permitted a more detailed assessment of dentofacial development. As shown in Fig. 1, despite the absence of many teeth (both primary and permanent), the size of the maxilla and mandible is not excessively less than might be expected in a normal girl of the same age. When the mother and daughter are compared, the similarity of dentofacial development is evident.

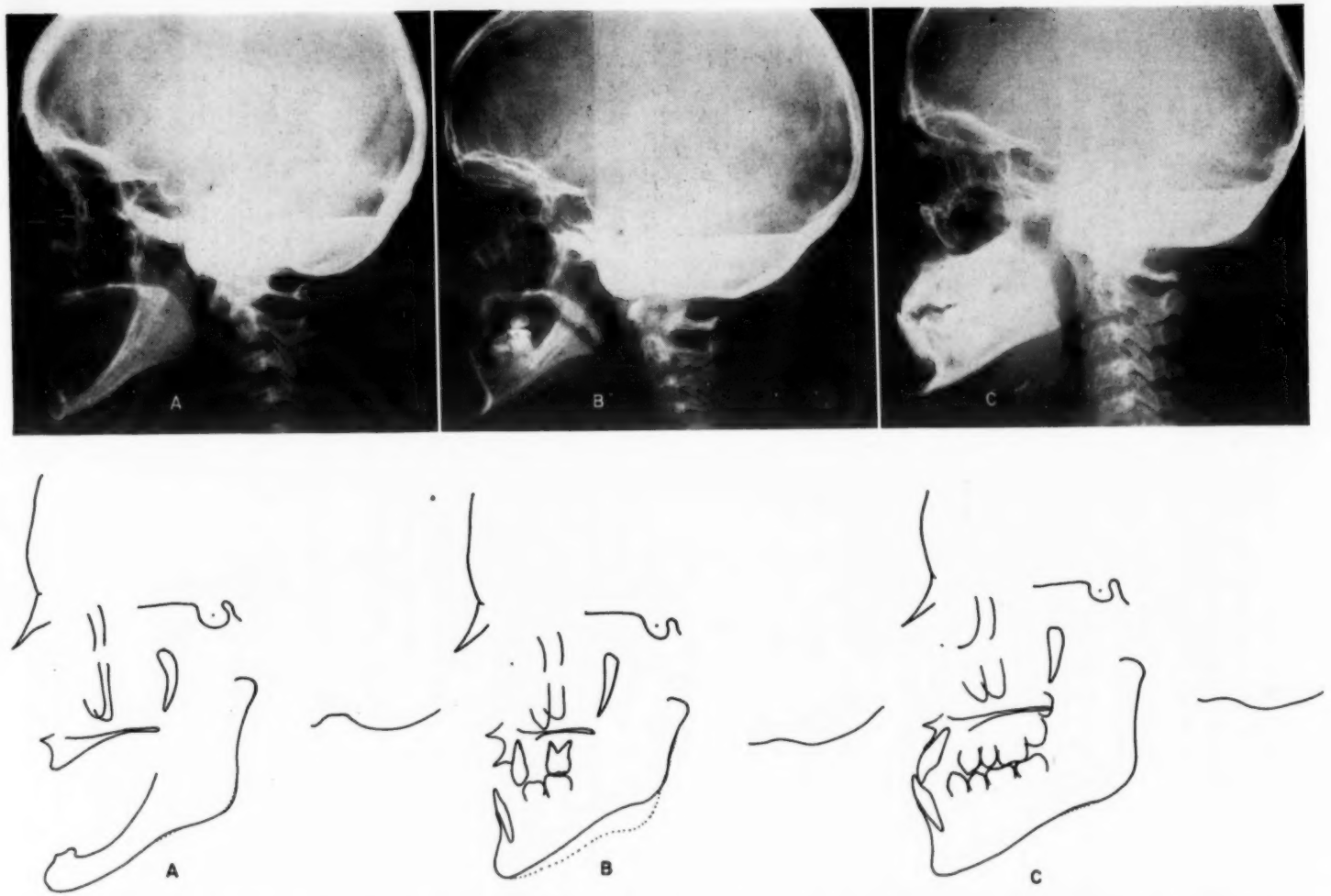


Fig. 1.—Comparison of the dentofacial development of a child with congenital ectodermal dysplasia and anodontia, and her mother and sister with mandibular protrusion. *Top*, left to right: the mother (S. M., *A*), the affected sibling (V. M., *B*), and her sister (M. M., *C*). *Below*, tracings of the cephalograms. Note the mandibular protrusion common to all three subjects, despite other dental and facial differences.

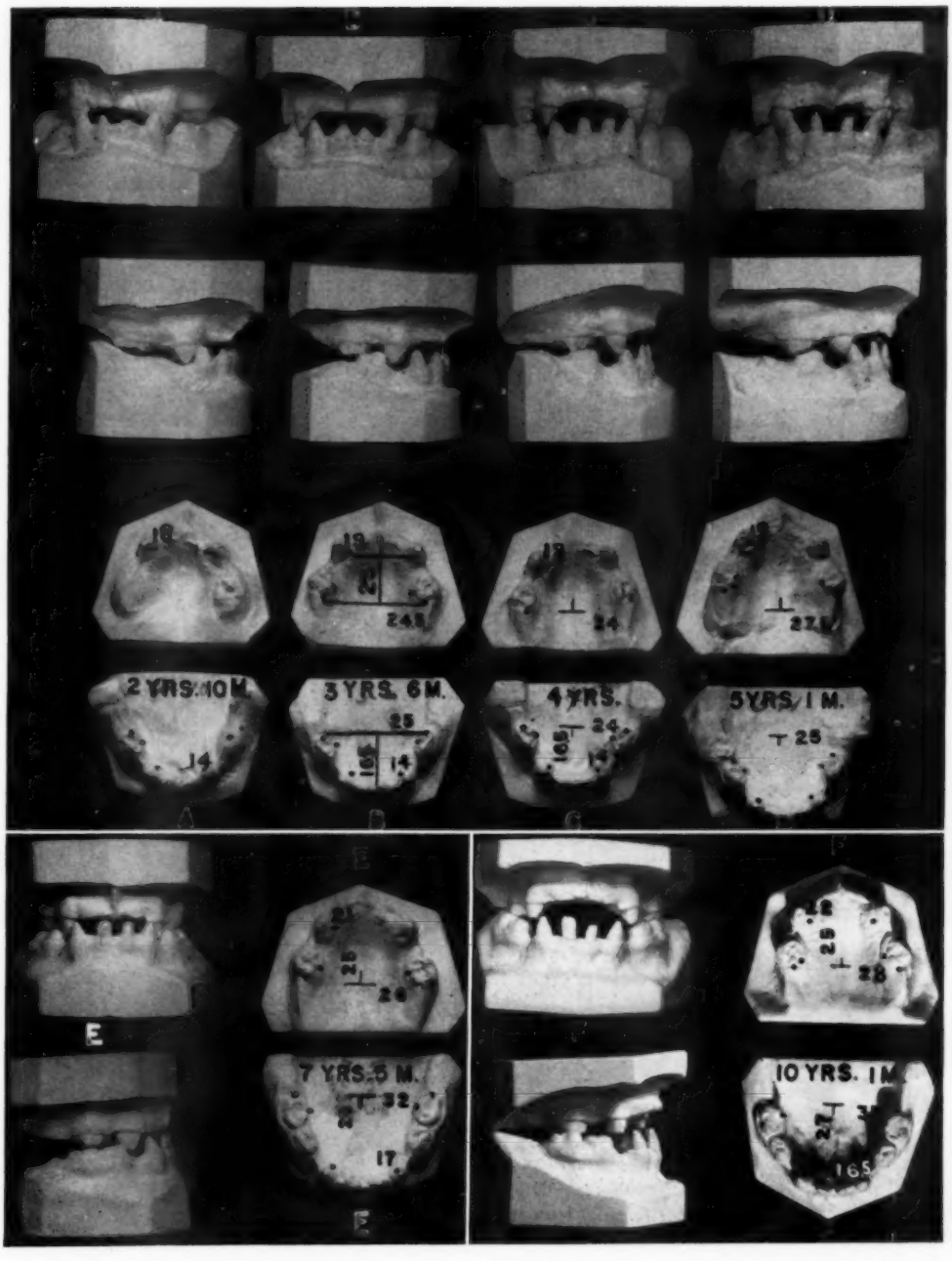


Fig. 2.—Maxillary and mandibular casts of V. M. from the age of 2 years, 10 months, to 7 years, 5 months. *A*, 2 years, 10 months; *B*, 3 years, 6 months; *C*, 4 years; *D*, 5 years, 1 month; *E*, 7 years, 5 months; *F*, 10 years, 1 month.

Note increase in intercanine distance, anteroposterior growth of maxilla and mandible, and the development of the intermaxillary space.

As mentioned previously, the mother's occlusion (Fig. 1,*A*) may be described as prognathous, resembling in appearance an Angle Class III occlusion. This is also observed in the cephalometric radiograph of the older (unaffected) child (M. M.) (Fig. 1,*C*), where the mandibular incisors are in labioversion. The affected sibling (V. M.), despite the absence of many teeth, follows the same occlusal pattern, although the mandible is smaller.

Despite the dental deficiencies, the maxillary and mandibular arches and the face as a whole, have continued to grow at or about the expected rate in V. M. (Fig. 1,*B*). Clearly, the presence of teeth is not a basic prerequisite for arch growth and facial development. Since 2 years of age, V. M. has exhibited a mandibular prognathism similar to that of her mother and sister, even though very few erupted teeth remain in the mandible.

### PITUITARY DWARFISM AND THE GROWTH HORMONE FACTOR

Pituitary dwarfism is a disorder characterized by general growth failure. In contrast to chondrodystrophic dwarfism, where only certain bones are affected and the resulting dwarf is markedly abnormal in proportions, the pituitary dwarf is small, but well proportioned. It is known that in pituitary dwarfism the teeth are late to emerge, and occlusal disharmonies are common. Because pituitary dwarfism is caused by failure or deficiency of anterior pituitary growth-promoting substances, rather than end organ failures, it affords an opportunity to investigate the relative influence of these substances on the growth and development of the jaws and the formation and emergence of the teeth.

The present study is concerned with one pituitary dwarf (W. T.) aged 12 years, 4 months, at the time this article is written, whose general development has been followed since 2 years, 9 months, and whose dentofacial development has been followed since 3 years, 6 months (Fig. 3). The diagnosis of pituitary dwarfism was originally made on the basis of clinical symptoms and radiographic evidence of skeletal (carpal) retardation. Intermittent endocrine therapy was carried on, including the use of low-potency A.P.L. substance at 5 years, 6 months; thyroid substance at 7 years, 8 months; and methyl testosterone at 6 years, 7 months (carried on to the point of genital enlargement, but not pubic hair development).

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Fig. 3.—Maxillary and mandibular casts of W. T. with pituitary dwarfism from 3 years, 6 months, to 10 years, 1 month. *A*, 3 years, 6 months; *B*, 4 years, 2 months; *C*, 5 years, 5 months; *D*, 6 years, 5 months; *E*, 7 years, 5 months; *F*, 9 years; *G*, 10 years, 1 month; *H*, 12 years, 1 month. Note the late emergence of the permanent teeth, and the minimal change in arch dimensions, until near the twelfth year. At 12 years, 1 month, facial dimensions, carpal age, and arch dimensions are all close to the norms for 7 years, 3 months. Tooth emergence and eruption, on the other hand, come closer to the 10 year age norms.

The measurements of the casts were made by the method suggested by Bäume[1].

1. The length in millimeters of the deciduous arch, that is, the perpendicular distance from a line connecting the two postlactea (pl), to the infradentale (id) or prosthion (pr).
2. The width in mm. between the deciduous canines, i.e., intercanine distance (c-c). This was measured between the centers of the lingual cinguli at the gingival margin instead of between the cusp points, which flatten out as attrition progresses. The possible error by this procedure does not exceed 0.2 mm.
3. The width in mm. between the two second deciduous molars, i.e., intermolar distance ($m_2 - m_2$). This measurement was taken between the lingual development grooves at the gingival margin instead of between the changing occlusal surfaces.


Fig. 3.—*(For legend, see opposite page.)*

Since the time the diagnosis was first made, statural growth has been continuous, but definitely below the normal amount. At 3 years of age, W. T. was 5 inches below the age-height norms for boys, and at the most recent examination (12 years, 1 month) he was 15 inches below standard. Emergence of the permanent dentition was also late. The first permanent molars did not

TABLE III. AGE AT WHICH ERUPTION OF VARIOUS PERMANENT TEETH WAS NOTED IN PATIENT W. T.

| *Maxilla* | | | | | |
|---|---|---|---|---|---|
| Right | | | Left | | |
| $M_1$(8.2) | $I_2$(10.9) | $I_1$(9.0)† | $I_1$(10.0)† | $I_2$(11.0) | $M_1$(8.1) |
| $M_1$(8.5) | $I_2$(9.5)* | $I_1$(7.1)* | $I_1$(7.1)* | $I_2$(9.5)* | $M_1$(8.4) |

*The four mandibular deciduous incisors were extracted at 6 years, 6 months.
†The right maxillary deciduous central incisor had been removed at 6 years, 4 months, the left remained until 9 years, 4 months.

appear until the eighth year; the lower central incisors appeared at about age 7, while the lower lateral incisors did not appear until the age of 9½ years (Table III). The most recent tooth to emerge was an upper incisor (10 years, 10 months). Obviously, W. T. is retarded in both statural growth and tooth emergence, but the statural deficiency (amounting to 5 standard deviations) is far more pronounced than is tooth emergence (–2 to –3 standard deviations).

Skeletal (carpal age) is retarded to an amount consistent with the statural retardation by both the Todd and the Greulich-Pyle standards, while root formation is markedly retarded in contrast to crown formation which more closely approximates the age norms. At 12 years, 1 month, W. T. has a carpal age

TABLE IV. ARCH DIMENSIONS IN A PITUITARY DWARF FROM 3 YEARS, 6 MONTHS THROUGH 12 YEARS, 1 MONTH

| AGE | | INTERCANINE WIDTH (C-C) | | INTERMOLAR WIDTH | | ARCH LENGTH | |
|---|---|---|---|---|---|---|---|
| YEARS | MONTHS | MAXILLA | MANDIBLE | MAXILLA | MANDIBLE | MAXILLA | MANDIBLE |
| 3 | 6 | 20.0 | 15.0 | 26.0 | 24.5 | 25.0 | 22.0 |
| 4 | 2 | 20.0 | 15.0 | 26.0 | 25.0 | 25.0 | 22.0 |
| 5 | 5 | 19.0 | 15.0 | 26.5 | 25.0 | 23.0 | 22.0 |
| 6 | 5 | 19.0 | 13.0 | 26.0 | 24.5 | 23.0 | — |
| 7 | 5 | 19.0 | 12.5 | 25.0 | 24.5 | 23.0 | 22.0 |
| 9 | 0 | 19.0 | 13.5 | — | — | 36.0 | 28.0 |
| 10 | 1 | 21.0 | 12.5 | 30.0 | 28.0 | 36.0 | 30.0 |
| 12 | 1 | 21.5 | 13.5 | 29.0 | 27.0 | 33.0 | 30.0 |

(Todd) of 7 years, 3 months (Fig. 4), a stature age of approximately 6 years (using the Fels Institute norms), and a dental age of approximately 10 years. Although tooth emergence is retarded, it is in advance of general skeletal development.

The growth of the dental arches has been slight, from 3 years, 6 months, to 12 years, 1 month, and the major part of the increase has come recently. For seven years the intercanine distance remained nearly constant at 19 to 20

mm. (in the maxilla), the bimolar distance increased not at all until 10 years, 1 month, and arch length remained constant until the ninth year (Table IV). During this time it was necessary to remove two permanent mandibular lateral incisors and several retained deciduous incisors and the left maxillary lateral incisor. The teeth not only erupted late, but abnormalities of position were also observed. Without extractions of retained deciduous teeth and three permanent teeth, the effect of the hypopituitary condition on the dental occlusion would have been even more striking.

Fig. 4.—Carpal x-ray picture of W. T., showing a skeletal age of 7 years, 3 months, at a chronological age of 12 years, 1 month (by the Todd 1937 Standard).

In this case of pituitary dwarfism, skeletal and facial development is retarded, tooth emergence less so. Evidently the growth hormone factor does not play an equal role in skeletal growth and tooth emergence and eruption alike. Cephalometric roentgenograms taken of W. T. at the age of 12 years and 1 month (Fig. 5), compared with a normal child the same chronological age, show a well-proportioned, but much smaller, craniofacial development (Fig. 6). The dental development in the pituitary dwarf is markedly retarded when compared with the normal child.

### MORQUIO'S SYNDROME AND COMPARATIVE GROWTH

Morquio's syndrome, first described by Morquio in 1929, is an exceedingly rare dyschondroplasia, characterized by dwarfism, kyphosis and scoliosis, genu

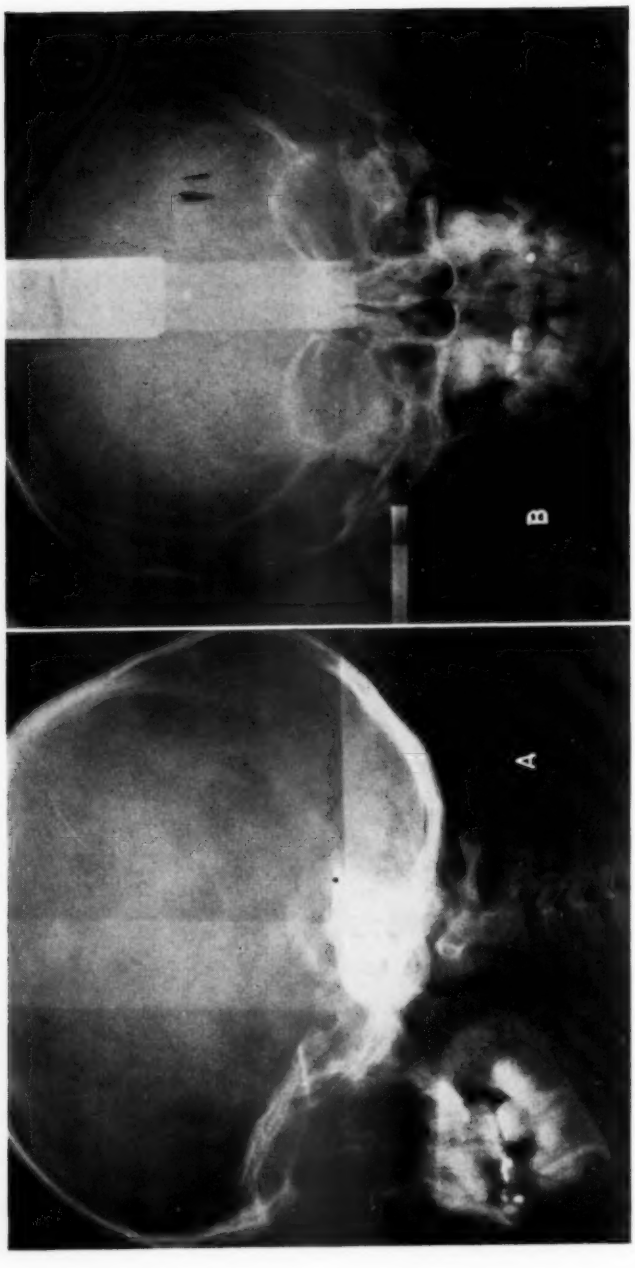


Fig. 5.—The pituitary dwarf (W. T.). The skull roentgenograms of W. T. Note small sella turcica and generally small facial bones.

valgum, sternal eversion, flattened vertebrae, ulnar deviation, and a host of related skeletal abnormalities. In most cases the disorder appears to be inherited as a simple Mendelian dominant trait, and the characteristic deformities are usually evident by the first birthday. In some cases, at least, enamel deficiencies are associated with the skeletal defects.


Fig. 6.—Cephalometric tracing of W. T. at the age of 12 years, 1 month (*A*), compared with a normal child of the same chronological age (*B*). Note infantile craniofacial development of W. T., as compared with normal child the same chronological age, and the markedly retarded dental development of W. T.

Because the abnormalities are so widespread in Morquio's syndrome, and because the disorder is characterized by defective bone formation, it offers an opportunity to compare craniofacial growth to skeletal growth in general.

The present study is concerned with three affected siblings (M. D., F. D., and E. D.), the first, second, and fourth of a total of nine children. The remaining six siblings, the parents, and, as far as is known the parents' siblings and other relatives are free from the trait. All three affected siblings showed, by the end of the first year of life, skeletal deformities and growth retardation characteristic of the disorder. All three have been followed through the completion of the secondary dentition, with the exception of M. D.

The most obvious abnormality in all three cases is dwarfism. At 13 years, 6 months, the first-born girl (M. D.) stood 92.5 cm. tall and weighed 40 pounds. The second child (F. D.) was 98.5 cm. tall and weighed 43 pounds at 11 years, 6 months (Fig. 7). The third affected sibling (E. D.) was 94.3 cm. tall and weighed 35 pounds at 8 years, 10 months. Over a period of nearly four years, subsequent changes in stature and weight have been negligible.

Many skeletal abnormalities were noted in the roentgenograms, besides the grotesque proportions evident in the photograph. The long bones were bowed and twisted, the ends characteristically irregular or "mouse eaten," many epiphyses were irregular in outline, and most centers of ossification were markedly delayed. In addition, the vertebrae were flattened and warped,

especially in the cervical region (leading to the "neckless" appearance shown in the photograph). The femoral heads and acetabula were also malformed, and below the atlas there was no bone free of distortions or irregularities in any of the three afflicted children.

Fig. 7.—Cranial and postcranial development in Morquio's syndrome (F. D.). *A*, Vetebral compression and near-normal facial and occlusal relationships. *B*, Carpal x-ray picture of F. D., showing spool-shaped, shortened digits, irregular carpal bones, missing epiphyses, and irregular thickened long bones.

In striking contrast to the stunted and twisted trunk and limbs, the head and face presented few abnormalities, other than the enamel deficiency noted previously, slight clouding of the corneas in one child and a slightly depressed nasal root in all three children. In head length and breadth, all three were not

far from the age norms; facial length, breadth, jaw breadth, and upper facial length were much closer to the age norms than might be expected. Only one measurement (head length) in one of the affected girls (E. D.) was sufficiently small to cause comment. In contrast to stature (which averaged 6 standard scores below the norms) and weight (which averaged standard scores below expectancy), the facial measurements suggested little or no retardation in craniofacial growth (Table V).

TABLE V. FACE AND BODY DIMENSIONS IN THREE SIBLINGS AFFECTED WITH MORQUIO'S SYNDROME

| | M.D. | AGE NORM* | F.D. | AGE NORM | E.D. | AGE NORM |
|---|---|---|---|---|---|---|
| 1. Age (yrs.) | 13-6 | — | 11-6 | — | 8-10 | — |
| 2. Stature (mm.) | 925 | 1590 | 985 | 1472 | 943 | 1331 |
| 3. Weight (lbs.) | 40 | 108 | 43 | 83 | 35 | 63 |
| 4. Head length (mm.) | 175 | 182 | 182 | 187 | 160 | 179 |
| 5. Head breadth | 145 | 147 | 148 | 149 | 137 | 143 |
| 6. Bizygomatic | 120 | 126 | 122 | 125 | 111 | 118 |
| 7. Bigonial | 99 | 98 | 89 | 98 | 84 | 88 |
| 8. Total face length | 101 | 108 | 111 | 107 | 97 | 98 |
| 9. Upper face length | 64 | 60 | 60 | 60 | 60 | 58 |
| 10. Nose length | 40 | 47 | 41 | 45 | 40 | 44 |
| 11. Nose breadth | 37 | 37 | 32 | 35 | 30 | 34 |

*Stature and weight norms from Sontag and Reynolds,[13] facial norms from Garn and Shade,[10] except for 9, 10, and 11, which are pooled from various sources.

Dentally, and from the point of view of occlusion, these three children affected with Morquio's syndrome are in a satisfactory condition. The caries incidence in all three is low; at the present time, it is lower than the four older of the other six siblings. The teeth, smaller than average because of the thin enamel, are well aligned in the arches. There is no crowding, but rather all teeth are separated by slight equal diastemata. In all three affected siblings, there is a slight protrusion in the premaxillary region, a condition markedly different from that in two of the unaffected siblings who exhibit premaxillary protrusion, crowding of the anterior teeth, and tooth rotation.

In short, occlusion is functional and pleasing in the three affected siblings; cranial and facial size and proportions are at, or near, the norms (with the possible exception of cranial length); and the craniofacial complex seems to have escaped, in large part, the osseous defects and retardations prevalent in the postcranial skeleton.

## DISCUSSION

In the first example presented (congenital ectodermal dysplasia) we find that, despite the absence of one-half the normal complement of deciduous teeth and the absence of nearly all the permanent teeth, facial growth and jaw growth proceed in normal fashion. It is true that in the affected child some alveolar bone is missing, and in this respect she resembles an edentulous subject, but the jaws themselves grew, regardless of erupting teeth, at a rate and to a size consonant with expectation (as can also be demonstrated in total anodontia). That erupting teeth may play some role in dentofacial growth

cannot be categorically denied; yet, in the present case, it is possible to doubt that the tooth factor plays a major role in facial or jaw growth. Jaw growth is obviously not primarily dependent upon the presence of teeth.

Ordinarily, one notes a parallelism between the number of teeth present (that is, dental stage) and arch size per se. This in itself suggests a causal relationship; it suggests that the erupting teeth in some way "create" the necessary bone. But when we observe jaw growth in the absence of erupting teeth and find that it does not differ from expectancy, it is no longer possible to suggest a causal relationship. Statistically speaking, there is merely an association in time, but no true correlation. The temporal association may be in time attributed to common growth-stimulating and emergence-stimulating hormones.

In the second example (hypopituitarism) just such a stimulating hormone has been investigated. Here it is evident that facial growth, tooth emergence, and tooth formation are all delayed when normal production of growth-stimulating hormones does not take place. Growth-stimulating hormone (or hormones) may thus be accepted as a factor, and a very important factor, in normal dentofacial growth. However, in pituitary dwarfism different segments of the dentofacial complex are differentially retarded. The jaws are markedly retarded resembling the posteranial skeleton in this respect. The teeth, on the other hand, although retarded in emergence and in formation, are advanced in respect to skeletal age and jaw formation, and demonstrate the relative independence of epithelial growth by pituitary hormones. Thus, in view of the discrepancy between osseous development and root formation on the one hand and emergence on the other, it is not difficult to understand why malocclusion is common among circus midgets, as reported by Dupertuis. Here we are dealing with a factor influencing both craniofacial growth and growth of the posteranial skeleton.

The final example, Morquio's syndrome, serves to show a great discrepancy between cranial and posteranial growth in the presence of a rare, genetically determined dyschondroplasia. Below the first cervical vertebra, growth is disordered and retarded. The pelvic and shoulder girdles are malformed, the vertebrae are compressed, and the long bones and peripheries are markedly affected. Above the cervical region growth is more orderly, cranial and facial size is at or near average dimensions, and the teeth which have emerged on schedule are in nest alignment, without crowding or functional malrelationship.

In Morquio's syndrome the brain grows normally, and sutural growth of the cranial vault, which is primary connective tissue growth, proceeds in an orderly manner. The cranial base and the axial and appendicular skeleton grow by primary cartilage proliferations. Primary cartilage growth in the base of the skull is not arrested in this condition, therefore, the anteroposterior development of the base of the skull appears to be within normal limits. However, the cartilaginous proliferation of the axial and appendicular skeleton is arrested.

When a hereditary dysfunction of the cartilage is seen, as in fetal chondrodystrophy (achondroplasia), both the craniofacial and posteranial skeletons are affected. This type of dwarfism is characterized by extreme shortness of limbs and cranial base, as well as saddling of the nose, and a marked bulging of the forehead. The musculature of the masticatory skeleton, as well as the dentition and tongue, appears normal in Morquio's syndrome. These factors may be responsible for a normal craniofacial development and a dwarfism of the posteranial skeleton in Morquio's syndrome.

In summation, by employing the approach described in the introduction, three factors in dentofacial growth have been explored. The first, tooth factor, has been shown to play no important role in dentofacial growth. The second, or growth hormone factor, has been shown to play an important but differential role in facial growth and tooth emergence, respectively; and finally it has been demonstrated, through the investigation of a rare genetically determined dyschondroplasia, how the growth of the cranial and posteranial skeleton may exhibit marked divergencies.

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# AN ANALYSIS OF ORTHODONTIC EXPANSION IN UNILATERAL CLEFT LIP AND CLEFT PALATE PATIENTS

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## INTRODUCTION

THE idea that orthodontic expanding forces might give different results in persons with cleft palate and/or lip than they did in normal persons has been advanced by a number of workers. These men have held that in the usual type of orthodontic treatment any expansion of the dental arch was confined to the teeth and the alveolar process immediately surrounding them, while in the cleft palate case the same forces might well lead to movements of the two maxillae in relation to each other with actual tooth movement held to a limited amount. Most of these studies have been conducted on plaster casts of the treated cases, a method that allowed only a demonstration of greater than average movement of teeth.

Harvold[1] was the first to attempt a qualitative study of this problem. He created cleft palates in normal monkeys by surgical means and then applied expansion forces to their maxillary arches. To determine the sites where bone changes took place, he alizarinated the monkeys while the forces were active and demonstrated that the most significant activity took place at the suture lines that separated the maxilla from the bones surrounding it. This indicated to him that the maxilla was being shifted en toto by the force.

The present study was directed toward a similar end but the method employed was frontal cephalometric laminography, a body-sectioning x-ray technique. Its advantages lie in the fact that it is possible to focus the image at any predetermined depth and to obtain successive registrations over long periods of time. Such registrations are rather strictly comparable, thus permitting quantitative determination on the living individual. The technique has been described elsewhere by Brader[2] and will not be repeated here.

Although the main purpose of the study was to determine whether there was a difference in response to expanding forces in the cleft and noncleft patient, it was found possible to gain information on several additional points that are equally important in the rehabilitation of the cleft palate patient. These included (1) the effects of lip surgery alone on the behavior of the cleft

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palate, (2) the effects of surgical and/or orthodontic forces on the nasal cavity and associated areas not accessible to study by other means, (3) the effects of orthodontic expansion on postoperative cleft palates and lips in relation to age.

### EFFECTS OF ORTHODONTIC EXPANSION IN POSTOPERATIVE UNILATERAL CLEFT LIP AND PALATE AND ON NONCLEFT PATIENTS

*Material and Method.*—The sample selected for the study consisted of six patients with surgically repaired unilateral cleft lips and palates on whom laminagrams and plaster models were available at the beginning and end of the orthodontic expansion. One noncleft patient and one with only a posterior palatal cleft, on whom similar records were available, were utilized as controls. These cases were orthodontically expanded at the Cleft Palate Center of the University of Illinois. All were treated with the Arnold Expander.[3]

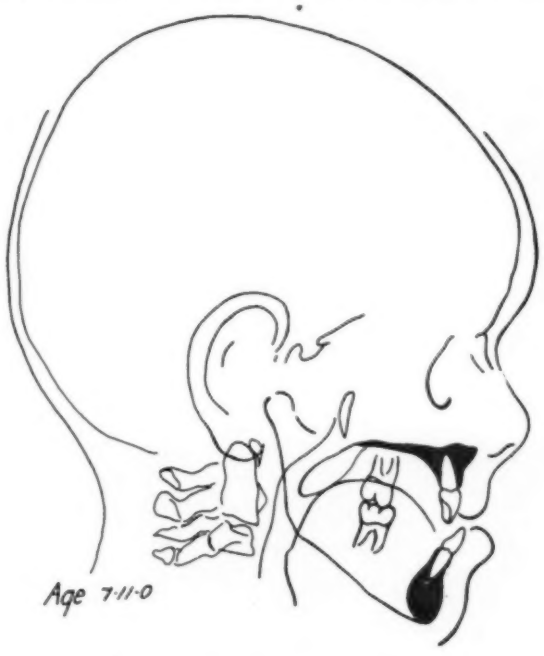


Fig. 1.—Lateral headplate tracing of a patient with a surgically repaired unilateral cleft of the lip and palate. The results of orthodontic expansion in this case will be depicted in Figs. 3 to 5.

In addition to these, a sample on which only plaster casts and cephalometric headplates were available was studied. This consisted of ten cleft lip and palate patients, ten noncleft expansions, and two patients with repaired posterior clefts. The majority of these patients had received their expansion therapy in the Department of Orthodontics at the University of Illinois.

Laminagraphic records on the first sample consisted of frontal sections taken before and after expansion at five depth levels as follows:

1. Anterior alveolar process.
2. Maxillary cuspid areas.

3. Zygomatic processes of maxillae.
4. First permanent molar areas.
5. Maxillary tuberosities.

Tracings were superimposed on tangents to the cranial base and registered on the nasal septum.

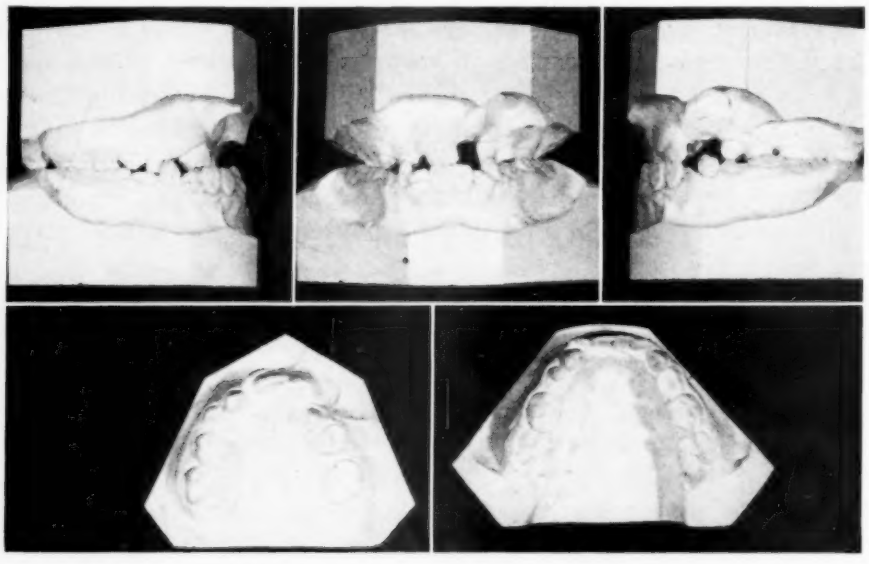

Fig. 2.—Casts of the child depicted in Fig. 1. Note the maxillary constriction resulting in a bilateral cross-bite; the retruded relationship, anteroposteriorly, of the maxillary dentition; and the containment of the smaller alveolar segment within the premaxillary element of the larger segment.

Fig. 3.—Cast reproductions of the maxillary arch prior and subsequent to orthodontic expansion. Note the unlocking of segments and the rapid eruption of the maxillary left central incisor.

At the level of the most superficial "cut," that is, the anterior alveolar region, the most striking changes in the cleft cases were those which had occurred in the nasal cavity. This is well shown in Fig. 5 where there is seen to be contact between the inferior turbinate and the nasal septum on the side of the cleft prior to expansion. Following the application of orthodontic expan-

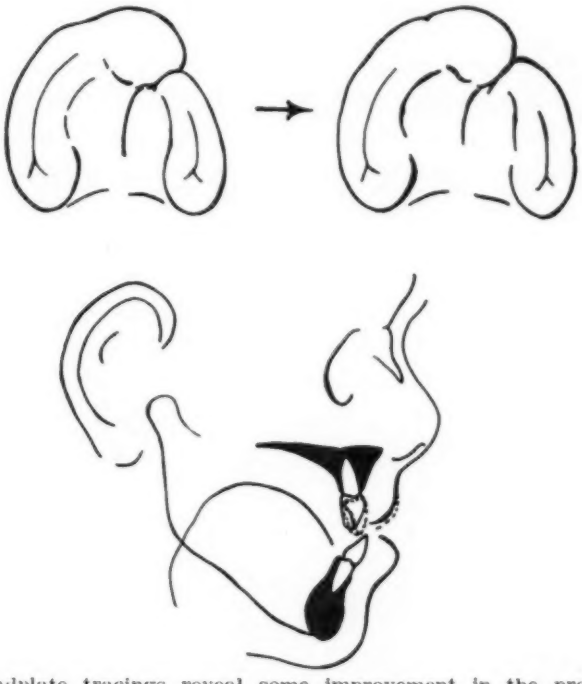

Fig. 4.—Lateral headplate tracings reveal some improvement in the profile as a result of orthodontic expansion.

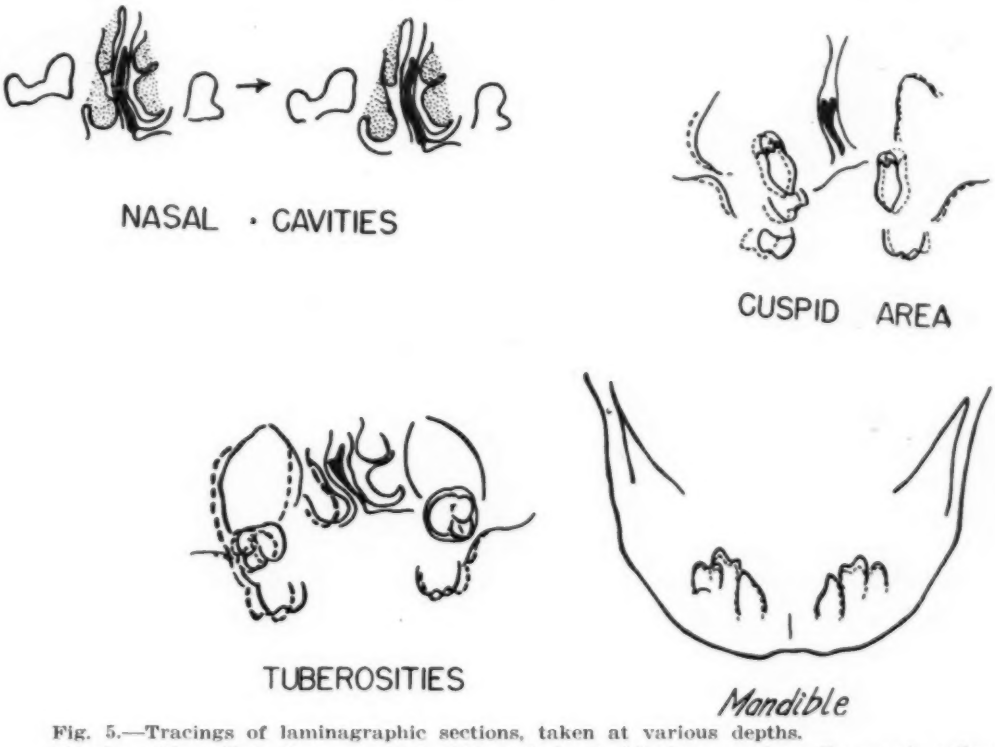


Fig. 5.—Tracings of laminagraphic sections, taken at various depths.

*Nasal cavities:* Note the movement of the inferior turbinate away from the nasal septum. This results in an increased air passage and improved ventilation of the nasal cavity.

*Cuspid area:* The permanent cuspids are unerupted and were not directly influenced by the orthodontic force. The position of the cuspids, prior to expansion, is indicated by the solid line, and subsequent to expansion, by the broken line.

*Tuberosities:* Increased lateral dimensions in the tuberosity region as a result of orthodontic expansion. The inferior nasal concha now demonstrates a more normal relationship to the vomer bone.

*Mandible:* Sections of the mandible, superimposed, to demonstrate that these changes are not a result of growth.

sion forces, the turbinate no longer contacts the septum and there is improved ventilation of that side of the nose. The septum itself, which was previously deviated toward the noncleft side, shows no change as the result of the treatment. In most of the cases, the opening of the nasal cavity was most marked anteriorly and decreased toward the back. However, in one case the nasal cavity was opened appreciably throughout its entire anteroposterior extent.

The crowns of partly formed, unerupted teeth, visible at the various depths, afforded additional means of determining the type of movement that had been induced by the forces employed in contrast to the teeth present in the mouth to which pressures had been directly applied.

In younger patients the increases between such unerupted teeth was strictly comparable to the changes seen in the nose, and indicated that the bones that housed them were moving, not the teeth (Fig. 5). This was further borne out by the increases which took place between the maxillary sinuses of the two sides.

At the deepest level, that is, at the area of the maxillary tuberosity, increases in width were also discernible but the difference in behavior of its two sides was more marked there than it was anteriorly. The movement was predominantly on the cleft side, with the opposite side appearing to remain relatively unchanged. It seemed significant, however, that the teeth in the noncleft side exhibited more buccal tipping, indicating that they had responded to the expanding forces.

*Laminagraphic Analysis of the Controls.*—Similar results of orthodontic forces were not observed in either of the controls studied radiographically (Fig. 6). No change was evident in the configuration of the nasal cavities or in the inclination of the deviated nasal septum. This finding is contradictory to the statement of Izard,[4] who has claimed that expansion of the dentition in cases of normal persons with a constricted maxillary arch creates an appreciable expansion of the nasal cavity and a straightening of deviated nasal septa. It agrees, however, with the findings of Brodie and his associates[5] that the effects of orthodontic forces are restricted to the alveolar process.

Aside from the alveolar process, the controls exhibited no discernible change in the bony framework or in maxillary position. The distances between unerupted teeth, the lateral walls of the nasal cavity, and the lateral margins of the maxillary sinuses remained constant.

The distance between the crowns of the teeth directly affected by the appliance increased materially. There was evidence not only of movement of the teeth directly subjected to the orthodontic force but of a change in the configuration of the surrounding alveolar process. Sometimes the teeth were moved bodily and sometimes they were tipped. This difference was probably related to the manner in which force was applied. In neither of the controls was there, radiographically, an opening of the midpalatal suture, as reported by Derichsweiler.[6]

*The Effects of Lip Surgery on Clefts of the Palate.*—This portion of the study was conducted on twelve patients with unilateral cleft palates. All were

under study at the Cleft Palate Training Center, University of Illinois, and cephalometric laminagraphs were available for each prior to lip surgery and approximately three months thereafter.

The frontal plane selected for study was that which passes through both zygomatic bones. This plane is easily and accurately established and makes possible the examination not only of the landmarks mentioned, but also the palatal shelves, tooth germs, and nasal turbinates, particularly the inferior. All infants were sedated with a barbiturate at the time the records were made.

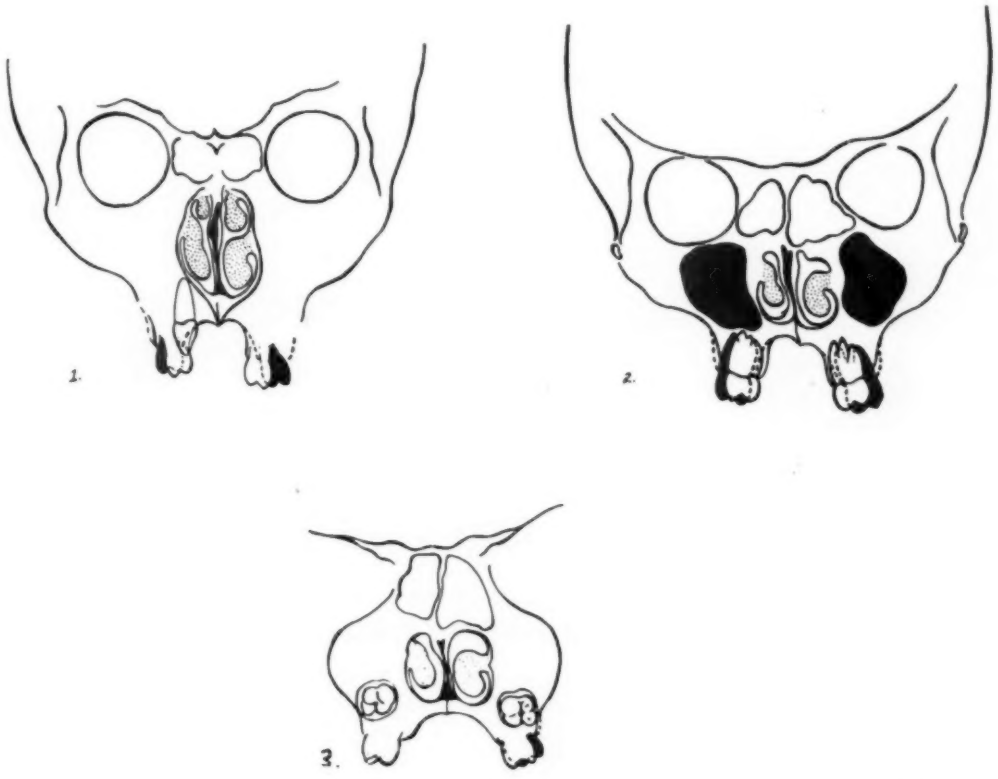


Fig. 6.—Tracings of laminagraphic sections taken on the orthodontically expanded normal patient. Sections include: (1) cuspid area (the left cuspid is unerupted); (2) the first permanent molar area; and (3) the tuberosity area.

There are no discernible changes in maxillary position. The width dimension between teeth within their crypts, lateral wall of the nasal cavity, and lateral margins of the maxillary sinuses remained constant. There is evidence of tooth movement and a change in the configuration of the surrounding alveolar process.

A comparison of the records made before and three months after lip surgery revealed average growth increases in all parts of the head except the maxillary region. Here, the distance between the lateral walls of the nasal cavity remained the same or decreased in ten of the twelve cases (Fig. 11). In some, the decrease was sufficient to bring about contact between the inferior turbinate and the nasal septum. The distance between the edges of the palatal shelves showed corresponding decreases. Plaster models of the mouths of the same infants similarly revealed narrowing of the alveolar arch and of the cleft. The

records of two patients with cleft of the lip but with normal palates did not reveal similar evidence. In both there occurred the expected increase of the nasal width that normally accompanies head growth.

*Plaster Cast Analysis.*—By means of dividers, the width dimension between chosen landmarks was recorded before and after expansion. It was felt that this evaluation would add further information relative to maxillary movement versus movement of teeth and alveolar process.

Cast analysis involved the selection of readily discernible landmarks on the palate, such as the medial margins of rugae and pits. The distance between selected landmarks before and after expansion was measured. Care was taken to choose landmarks directly on the palate and as close as possible to the midpalatal suture. No landmarks approaching the area of the alveolar bone were included, since any change within the underlying bone might create a change in position of the chosen soft tissue landmark. Obviously, the conventional measurement of distance between teeth would not afford information as to whether expansion occurred in terms of maxillary adjustment or in terms of individual teeth (Fig. 7).

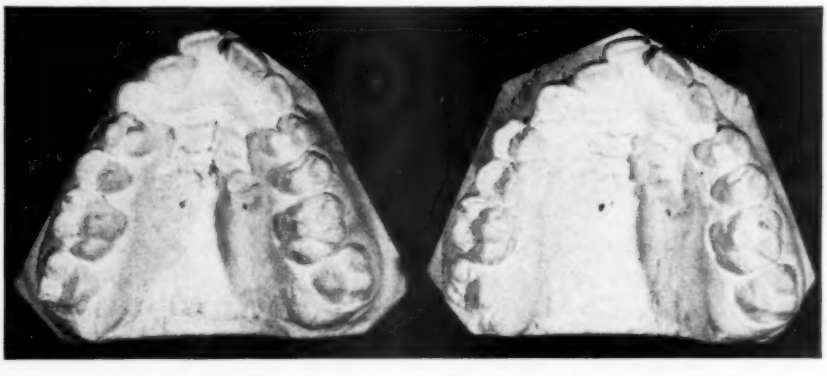

Fig. 7.—Casts of the control in Fig. 6. There appears to be an increase of about 0.75 mm. between landmarks as a result of expansion; the largest change in normal persons. (Table I). It is believed that this is partially due to a change in position of the soft tissue landmark as a result of the change in configuration of the alveolar process.

The magnitude of the differences in width gains between the cleft and noncleft patients left little doubt that the movement in the cleft cases could not be explained on the basis of tooth movement alone (Table I).

*Expansion in Relation to Age.*—As a final step in the study, the cleft patients were examined in accordance with age, and contrasting results are illustrated in Fig. 12. From all indications, the repositioning of bony segments in cleft palate cases takes place more slowly as age advances. This fact has been observed clinically by a number of writers. There appears to be little movement of the maxillae in adults, the increases in width being attributed to tooth movement and alveolar remodeling alone. It is likely that this difference in behavior is due to suture closure.

## DISCUSSION

Attention has been called to the importance of the restraining or molding influence on the alveolar processes of the buccinator and superior constrictor

TABLE I

| NORMAL PATIENTS | MEASUREMENT BEFORE EXPANSION (MM.) | MEASUREMENT AFTER EXPANSION (MM.) | CHANGE | MEAN CHANGE (MM.) | CLEFT PATIENTS | MEASUREMENT BEFORE EXPANSION (MM.) | MEASUREMENT AFTER EXPANSION (MM.) | CHANGE | MEAN CHANGE (MM.) |
|---|---|---|---|---|---|---|---|---|---|
| 1. D. J. | 9.75 | 9.75 | 0 | | 1. C. C. | 7.25 | 15 | +7.75 | |
| 2. D. H. | 9 | 9.75 | +0.75 | | 2. J. H. | 10 | 14 | +4.0 | |
| 3. F. H. | 14 | 14 | 0 | | 3. C. O. | 7 | 13 | +6.0 | |
| 4. R. D. | 7 | 7.3 | +0.3 | | 4. P. B. | 4 | 7 | +3.0 | |
| 5. C. P. | 8.25 | 8.5 | +0.25 | | 5. B. J. | 15 | 18 | +3.0 | |
| 6. Ra. D. | 8 | 8 | 0 | | 6. D. G. | 9.75 | 13 | +3.25 | |
| 7. R. B. | 9.25 | 9 | −0.25 | | 7. N. B. | 3 | 6 | +3.0 | |
| 8. N. C. | 9.25 | 9.25 | 0 | | 8. C. L. | 9 | 12 | +3.0 | |
| 9. L. L. | 8.75 | 9 | +0.25 | | 9. P. O. | 2 | 6 | +4.0 | |
| 10. E. G. | 12.5 | 13 | +0.5 | | 10. D. N. | 2 | 3.5 | +1.5 | |
| | | | | +0.18 | | | | | +3.85 |
| | | | | | POSTERIOR CLEFTS | | | | |
| | | | | | 1. A. Y. | 15 | 15.5 | +0.5 | |
| | | | | | 2. D. L. K. | 10 | 10 | 0 | +0.25 |

pharyngis muscular ring by Brodie[7] and others who have also emphasized the expansive forces contributed by the tongue. These two opposing forces normally create the smooth curvature of the alveolar arch. The occurrence of a cleft lip and palate results in a loss of the continuity of the outer muscular ring and a disturbance of the balance between them. Such a disturbance of normal muscular balance frequently results in outward and upward positioning of the maxillary segments prior to surgical intervention (see Fig. 8).

The surgical correction of such cases often involves extensive undermining of the lip musculature as far posteriorly as the maxillary tuberosity (Fig. 9) and as far superiorly as the infraorbital canal. The resulting reduction in muscular tension facilitates the approximation of the two lip segments for surgical union. This restoration of the muscular integrity of the lip initiates a molding influence. In some cases, this molding results in an approximation of the two alveolar segments; in others, it is of sufficient strength to overrotate the segments medially (Fig. 10). The alveolar process of the smaller maxillary segment may become contained within the premaxillary alveolar element of the larger segment.

Owing to the site of its bony attachment, the repaired musculature may be instrumental in bringing about a narrowing of the palatal cleft in more posterior regions such as the area of the maxillary tuberosities. Even prior to palatal surgery, deciduous teeth present in the contained segment frequently erupt in a cross-bite relationship to the mandibular teeth.

Constriction of the maxillae and the locking of alveolar segments has been attributed to the influence of lip surgery by Blair,[8] Blair and Brown,[9] and Pruzansky.[10] Such constriction had been frequently attributed to palatal surgery. It is important, however, to recognize that such evidence of constriction presents itself in many cases before any surgical treatment of the palate has been undertaken (Fig. 11).

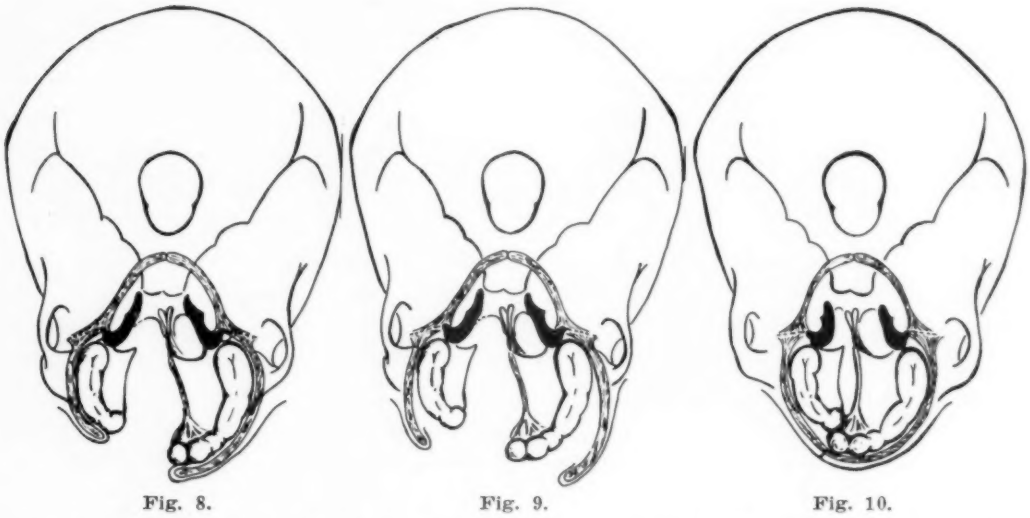

Fig. 8. Fig. 9. Fig. 10.

Fig. 8.—Drawing of the inferior view of a skull illustrating the disturbance in the continuity of the muscular ring and an outward positioning of the maxillary segments.

Fig. 9.—Surgical undermining of the lip musculature as far back as the maxillary tuberosities.

Fig. 10.—Drawing to illustrate the overrotation of the maxillary segments, in some cases as a result of the muscular influences of the reconstituted lip.

Recognition of the extent of the constriction and the forces operating to produce it is essential to a sound procedure of correction. In terms of orthodontic rehabilitation the containment of one alveolar segment within the other cannot be taken lightly. It is in this area that the full implications of growth must be considered. Most frequently, the deciduous teeth contained within the smaller segment and in close proximity to the cleft remain in a partially erupted or impacted state with an accompanying sacrifice of alveolar growth. This is evident in the permanent dentition if adverse segmental relationships are allowed to be maintained.

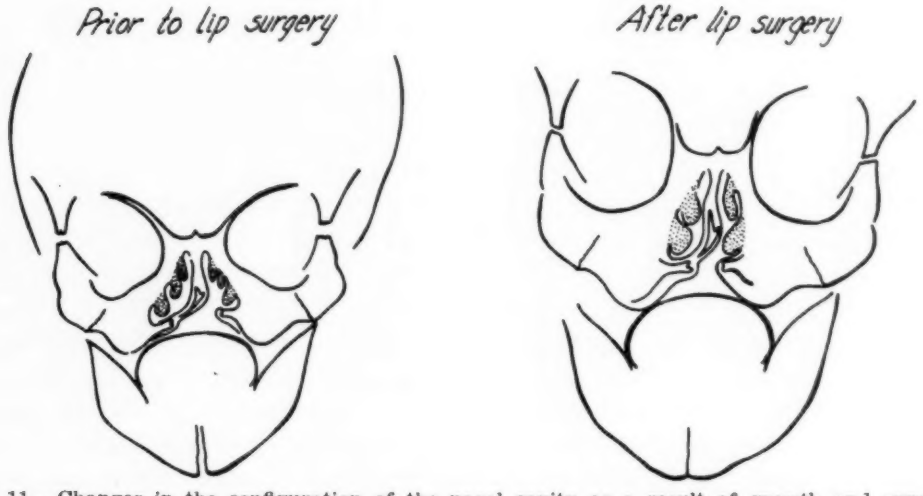


Fig. 11.—Changes in the configuration of the nasal cavity as a result of growth and surgical closure of the lip.

When orthodontic force is applied to unlock alveolar segments a rapid increase in growth is observed in the areas surrounding the erupting dentition. It is thus apparent that the initial phase of orthodontic therapy in these cases must be directed toward the counteracting of the new muscular influences created by the lip surgery. Frequently, this involves the repositioning of the alveolar segments and the establishment of an arch of more normal form.

The study reported here, as well as those of others, makes it obvious that maxillary constriction following lip surgery is not limited to the alveolar process. The entire maxilla, and particularly that on the side of the cleft, appears to be tilted inwardly. This results many times in a narrowing of the nasal cavity on the same side and an approximation of the turbinate and septum. All these conditions tend to become permanent with advancing age, that is, after growth has stopped or even slowed materially (Fig. 12).

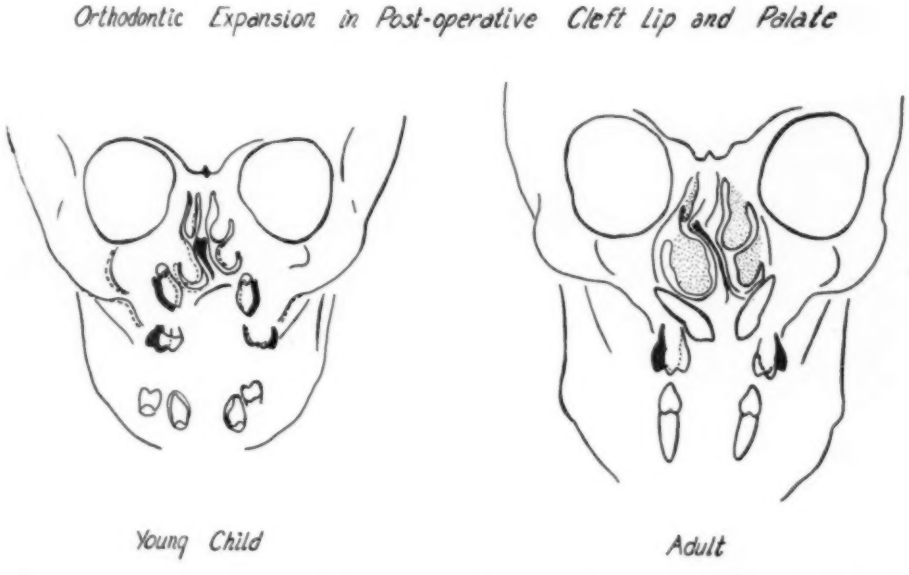


Fig. 12.—Differences in response to orthodontic expansion in relation to age. In the young child there is greater evidence for bony repositioning, as was demonstrated in Fig. 5. In the adult, orthodontic expansion appears to be a result of tooth movement; there is no change in the position of the impacted cuspids.

The early establishment of normal intermaxillary relationships by simple expansion techniques not only frequently brings about an immediate improvement of these conditions but, as well, affords the best preparation for future rehabilitation. The nasal cavity is given better ventilation, the tongue is permitted to assume a more normal position and, most important, the maxillae relieved of their impaction are enabled to grow in a more normal manner. Each of these makes an important contribution toward the total rehabilitation of the cleft palate child and makes easier and more effective the work of the specialists who may be responsible for other aspects of treatment. The surgeon advocates early expansion many times to more normally support the reconstituted lip. At the same time, in unoperated cases, he is provided with a better guide

in judging his chances of closing the palate successfully. The prosthodontist has normal jaw and tooth relationships with which to deal; the orthodontist is better able to arrange teeth in well-developed lines; and the speech therapist is provided with an improved oral architecture for more normal resonation and articulation.

Fig. 13.

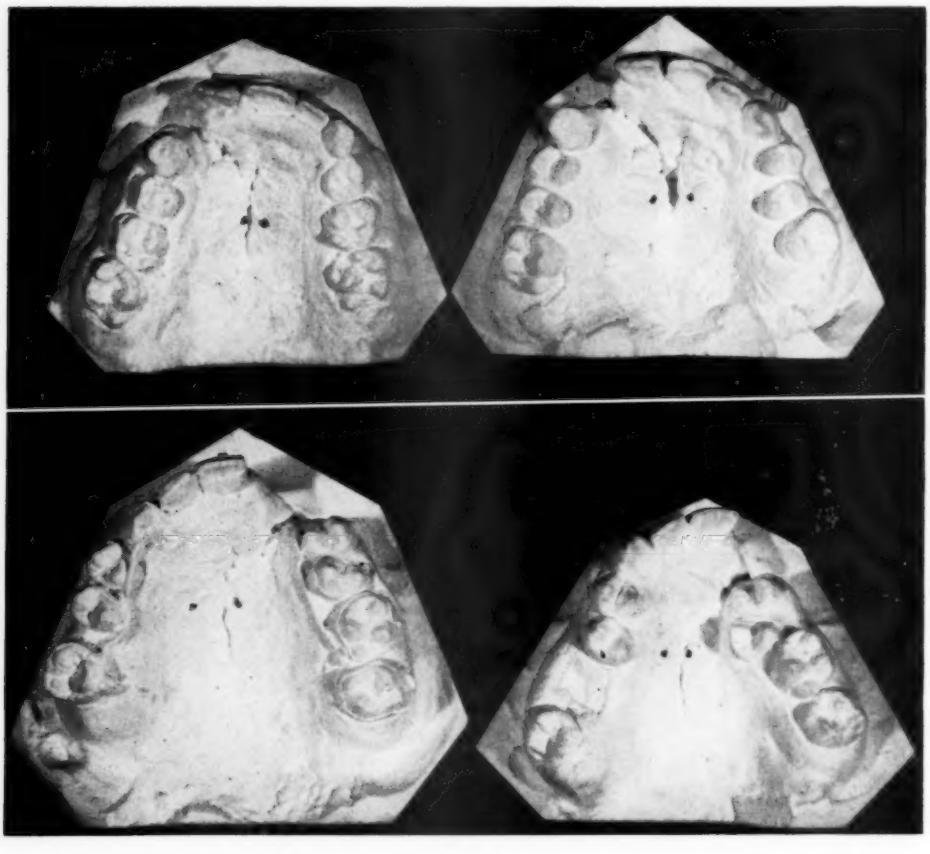

Fig. 14.

Fig. 13.—The opening up of a butt joint, anteriorly, as a result of orthodontic forces. This tissue did not appear to be surgically united prior to expansion.

Fig. 14.—A unilateral cleft case (age 14 to 15) illustrating some segmental movement, as well as a great deal of tooth movement.

Objection has been raised to expansion on the grounds that it might widen the cleft or open one already closed surgically. In rare instances is there opening of surgically united soft tissue as a result of judiciously applied expanding force. It must be stated that where abutment of one segment against the other was observed, the unlocking of segments by judicious force did result in opening up of the butt joints or unions (Fig. 13). However, with the advantages of more normal cosmesis, provision for future alveolar growth, improved masticatory function, and enhanced speech potential considered, this reopening anteriorly cannot be considered as contraindicative of expansion.

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# AGENESIS OF THE THIRD MOLAR IN MAN

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## INTRODUCTION

THIRD molar teeth are of special interest to dental clinicians and students of human evolution because of their wide range of morphologic variation and the frequency with which the formative organs fail to develop, resulting in complete absence of one or more third molars.

The present study concerns itself with the failure of the third molars to develop, a condition usually referred to as "congenital absence." For descriptive purposes, the word *agenesis* (a + genesis, "without generation") has been used in this report to describe the developmental or formative lack of this dental organ.

A review of the literature on agenesis of third molars (Table I) indicates that there has been a lack of uniformity in securing the data, with a resultant diversity of opinion in interpretation of the significance of the findings. Darwin,[1] Gregory,[2] and Hellman[3, 4] believed that third molars are decadent teeth which have a tendency to become vestigial in more civilized races of Man and which will eventually be lost. Hellman[4] concluded that any variation from the fundamental *Dryopithecus* pattern is a modification due to a gradual process of progressive evolution. This variation also has been regarded as a reversion to primitive tooth forms. If this were true, the conical "reversion types" of the third molar would closely resemble the fossil forms of their supposed prototypes. Yet, it can be shown that the conical third molar is not homologous with the reptilian tooth, but is an atrophic form resulting from the fusion of the three cusps of the tricuspid molar.[6]

Goblirsch,[5] observing the low percentage of missing teeth in patients at the Mayo Clinic, came to the conclusion that the third molar is not a decadent tooth. He agreed with Levine[7] that the third molar will not disappear from Man's jaws, but probably will remain in a rudimentary condition. The gene frequency responsible for the presence of third molars remains relatively constant, although in certain racial groups it is higher than in others. With our present knowledge of population groups, no marked trends can be demonstrated relative to the frequency of agenesis or diminution in size of the third molars. We can only say that, because groups of individuals differ morphologically from each other, differences in the incidence of absent third molars is associated with underlying genetic differences.

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TABLE I. CHARACTER OF MATERIAL PRESENTED BY PREVIOUS AUTHORS

| AUTHOR AND YEAR | ETHNIC GROUPING | CHARACTER OF MATERIAL | SEX DIFFERENCES | NUMBER OF SUBJECTS STUDIED | DENTAL HISTORIES | DENTAL CASTS | COMPLETE MOUTH X-RAYS | RELATIONSHIP BETWEEN DIMINUTIVE IN SIZE AND AGENESIS |
|---|---|---|---|---|---|---|---|---|
| Hellman,[9] 1936 | Mixed | Skulls | Yes | 735 ♂<br>314 ♀ | No | No | No | No |
| Banks,[8] 1934 | American whites | Patients | No | 461 | No | No | Yes | No |
| Goblirsch,[5] 1930 | American whites | Patients | No | 2,112 | Yes | No | Yes | No |
| Hellman,[9] 1936 | American whites | Individuals | Yes | 261 ♂<br>172 ♀ | No | No | Yes | No |
| Pedersen,[10] 1949 | East Greenland Eskimos | Skulls | No | 109 | No | No | Yes | No |
| | East Greenland Eskimos | Individuals | Yes | 257 | Yes | No | Partly | No |
| Goldstein,[11] 1920 | Eskimos | Mandibles | Yes | 363 ♂<br>380 ♀ | No | No | No | Yes |
| Leigh,[12] 1925 | American Indian | Skulls | No | 61 | No | No | No | No |
| Kajava,[13] 1912 | Finnish Lapps | Skulls | No | 194 Maxillae<br>137 Mandibles | No | No | No | No |
| Smith,[14] 1894 | Sioux Indians | Individuals | No | 10 | No | No | No | Yes |
| Mori,[15] 1931 | Japanese | Individuals | Yes | 7,541 ♂<br>2,290 ♀ | No | No | No | Yes |
| DeTerra,[16] 1905 | European | Patients | Yes | 500 | No | Yes | No | Yes |
| Thomsen,[18] 1952 | Mixed European and Negro | Individuals | Yes | 94 | Yes | Yes | Yes | No |

## THE PRESENT STUDY

A study of the entire dentition of 216 young women with an age range of 18 to 21 years was carried out at Forsyth Dental Infirmary for Children in Boston. All European ethnic groups commonly represented in the United States were included. There were no members from any of the colored races.

## METHOD OF STUDY

In the present investigation, a complete set of dental x-ray pictures was taken of each individual and a careful oral examination was given, utilizing good artificial illumination, a mirror, and a probe. Complete dental case histories were taken to rule out any possibility of early loss of permanent first molars, as well as extraction of third molars. Dental casts were also obtained. Sixteen individuals whose records were found to be unreliable were not considered in the analysis of data. After the elimination of doubtful cases, 200 dentitions were available for this investigation.

## AGENESIS

In the group of 200 individuals, eighteen showed agenesis of one or more third molars; of these eleven had absence of one tooth only (Figs. 1 and 2). Out of this eleven, the absent tooth was missing from the maxilla in seven cases; four persons had right third molars absent; and three had no left third molars. Among the four individuals with only one third molar absent in the mandible, three showed agenesis on the left side, while there was one instance of absence on the right side.

Four individuals in this study lacked two third molars each. In one of these, both right third molars were absent. The remaining three had bilateral agenesis of the mandibular third molars. Two individuals lacked three third molars. In both of them, the lone third molar was *present* on the left side of the maxilla. Only one person had agenesis of all four third molars.

In summarizing the findings, it can be said that the third molars showed absence in the mandible more often than in the maxilla, the ratio being 17 to 12. Goblirsch[5] found an approximately similar ratio for the agenesis of third molars in the maxilla and the mandible. The percentage of missing third molars computed on the basis of a full complement of four third molars in the 200 individuals studied is 3.5, while the percentage computed by Goblirsch from his records is 5.2. The percentage of those with all four third molars absent among the total number of individuals with one or more third molars lacking is 5.5. According to Goblirsch, it was 2.33 among his 2,112 patients. The number of individuals with all third molars missing in the Forsyth series is very small, which makes the parallel of the two percentage figures all the more interesting.

The percentage of missing third molars in the present group of 200 females is 9.0 as against 35.0 reported by Hellman[9] in his study of skulls belonging to many ethnic groups or 30.81 per cent in his x-ray series of adult females at

| No. | Name | Max. | | Mand. | |
|---|---|---|---|---|---|
| | | Rt. | Lt. | Rt. | Lt. |
| 1 | B.E. | P | Dim. | — | — |
| 2 | C. J. | Dim. | D | — | P |
| 3 | C.R. | Dim. | Dim. | P | — |
| 4 | P. M. | Dim. | Dim. | — | — |
| 5 | P. M. | — | — | — | — |
| 6 | T.N. | P | P | P | — |
| 7 | W.V. | — | P | P | P |

— Agenesis of tooth.

Dim. Size of crown diminished.

P Tooth present without obvious diminution in size of crown.

Fig. 1.—Status of third molars in seven individuals with various degrees of agenesis in a group of sixty-seven females examined in 1950 and 1951.

| No. | Name | Max. | | Mand. | |
|---|---|---|---|---|---|
| | | Rt. | Lt. | Rt. | Lt. |
| 1 | A.L. | — | P | P | P |
| 2 | B.R. | P | — | P | P |
| 3 | B.B. | — | P | P | P |
| 4 | C.E. | — | P | — | — |
| 5 | G.C. | Dim. | — | P | P |
| 6 | J.F | P | P | P | — |
| 7 | J. B. | Dim. | — | P | P |
| 8 | K.F. | — | P | — | P |
| 9 | A.R. | P | P | — | — |
| 10 | R.L. | — | P | — | — |
| 11 | W.M. | — | P | P | P |

Fig. 2.—Status of third molars in eleven individuals with various degrees of agenesis in a group of 133 females examined in 1948 and 1952. (See Fig. 1 for key to symbols.)

Columbia University. Banks[8] reported an x-ray account of agenesis of third molars in 461 individuals with an age range of 15 to 22 years. The number of missing third molars was 19.7 per cent, but no distinction between the sexes was made.

TABLE II. THE DISTRIBUTION OF MISSING THIRD MOLARS IN A GROUP OF 200 GIRLS, 18 TO 21 YEARS OF AGE

| Number of third molars missing | 1 | 2 | 3 | 4 | Total number of girls with one to four missing third molars |
|---|---|---|---|---|---|
| Number of girls | 11 | 4 | 2 | 1 | 18* |
| Percentage of total (18) | 61.1 | 22.2 | 11.1 | 5.6 | |

*This represents 9 per cent of the total number of 200 girls examined.

In the Forsyth group, as indicated in Table II, the individuals with only one third molar absent represent 61.1 per cent of the series, while those with all four teeth missing account for 5.5 per cent. This is in sharp contrast to the data obtained by Hellman and Banks, as shown in Tables III, IV, and V.

TABLE III. THE DISTRIBUTION OF MISSING THIRD MOLARS IN 314 SKULLS (FEMALE) EXAMINED BY HELLMAN

| Number of third molars missing | 1 | 2 | 3 | 4 | Total number of skulls with one to four missing third molars |
|---|---|---|---|---|---|
| Number of skulls | 30 | 31 | 18 | 31 | 110* |
| Percentage of total (110) | 27.27 | 28.18 | 16.36 | 28.19 | |

*This represents 35.04 per cent of the total number of 314 skulls examined.

TABLE IV. THE DISTRIBUTION OF MISSING THIRD MOLARS IN 172 ADULT WOMEN STUDIED BY HELLMAN

| Number of third molars missing | 1 | 2 | 3 | 4 | Total number of females with one to four missing third molars |
|---|---|---|---|---|---|
| Number adult females | 23 | 22 | 4 | 4 | 53* |
| Percentage of total (53) | 43.40 | 41.50 | 7.55 | 7.55 | |

*This represents 30.81 per cent of the total number of 172 adult females studied.

Goblirsch[5] made a report in 1930 based on a study of 2,112 patients with an age range of 17 to 78 years. A very careful roentgenographic examination was made, but the data for the two sexes were not segregated. Nine per cent of the patients showed agenesis of the third molars, which is in close agreement with my own findings.

To summarize the results of the present study still further, it can be added that in the maxilla, the third molars were more often absent on the right side

TABLE V. THE DISTRIBUTION OF MISSING THIRD MOLARS IN 461 INDIVIDUALS, 15 TO 22 YEARS OF AGE, REPORTED BY BANKS

| Number of third molars missing | 1 | 2 | 3 | 4 | Total number of individuals with one to four third molars missing |
|---|---|---|---|---|---|
| Number of individuals | 29 | 33 | 14 | 15 | 91* |
| Percentage of total (91) | 31.87 | 36.26 | 15.39 | 16.48 | |

*This represents 19.73 per cent of the total number of 461 individuals studied.

TABLE VI. DISTRIBUTION OF THE LOCATION OF NINETY-FIVE MISSING THIRD MOLARS IN 172 ADULT WOMEN STUDIED BY HELLMAN

| | NUMBER OF MISSING THIRD MOLARS | PERCENTAGE OF TOTAL MISSING THIRD MOLARS |
|---|---|---|
| *Maxilla:* | | |
| Right | 24 | 25.26 |
| Left | 22 | 23.16 |
| *Mandible:* | | |
| Right | 24 | 25.26 |
| Left | 25 | 26.32 |
| Total number of missing third molars | 95 | |

TABLE VII. DISTRIBUTION OF THE LOCATION OF 442 MISSING THIRD MOLARS IN 2,112 PATIENTS* AT THE MAYO CLINIC, 17 TO 78 YEARS OF AGE, STUDIED BY GOBLIRSCH

| | NUMBER OF MISSING THIRD MOLARS | PERCENTAGE OF TOTAL MISSING THIRD MOLARS |
|---|---|---|
| *Maxilla:* | | |
| Right | 110 | 24.89 |
| Left | 115 | 26.01 |
| *Mandible:* | | |
| Right | 106 | 23.98 |
| Left | 111 | 25.12 |
| Total number of missing third molars | 442 | |

*Both male and female patients were included in this study.

TABLE VIII. DISTRIBUTION OF THE LOCATION OF TWENTY-NINE MISSING THIRD MOLARS IN EIGHTEEN WHITE FEMALES, 18 TO 21 YEARS OF AGE

| | NUMBER OF MISSING THIRD MOLARS | PERCENTAGE OF MISSING THIRD MOLARS |
|---|---|---|
| *Maxilla:* | | |
| Right | 8 | 27.6 |
| Left | 4 | 13.8 |
| *Mandible:* | | |
| Right | 8 | 27.6 |
| Left | 9 | 31.0 |
| Total number of missing third molars | 29 | |

than on the left, the ratio being 8 to 4. In the mandible no marked difference was found for the two sides, the ratio between the right and left quadrants being 8 to 9. Tables VI, VII, and VIII show the percentages of lacking third molars in each quadrant of the dentition, as computed for the data collected by Hellman, Goblirsch, and myself respectively. It is of interest to note that the ratios of agenetic third molars in each quadrant are more or less the same in all these studies. The one exception is the relatively low incidence of missing third molars in the upper left quadrant of the dentitions examined in the present investigation.

## DIMINUTION IN SIZE

During the examination of the present group, a number of teeth were seen to have a very marked diminution in size. Such teeth have been referred to by

Goldstein[11] as vestigial third molars. The fact that third molars are very frequently diminutive in size may have far-reaching importance for two reasons. First, it may indicate an evolutionary trend toward agenesis. Second, their emergence and coming into alignment in the dental arch with the other teeth may be easier than for teeth of regular dimensions, thus avoiding the complications associated with unerupted and misplaced third molars.

In the present study there were no mandibular third molars which showed diminution in size, although nine maxillary third molars were either pyramidal, peg-shaped, or vestigial in character. Five of them were found in the left half of the maxilla and the rest in the right half. These nine "vestigial" third molars were seen in six different individuals, of whom three exhibited a bilaterality of the phenomenon. All these more or less peg-shaped teeth were found in association with the agenesis of one or more third molars in the individuals examined. Since none were found unassociated with some degree of agenesis, one may suggest that there is a causal relationship between diminution in size and complete agenesis.

According to Ruffer,[17] in a study of ancient Egyptian predynastic skeletal material, forty-five out of 156 skulls showed upper third molars that were noticeably smaller than the other third molars. In all forty-five the diminution was bilateral. Nineteen of the 45 mandibles examined by Ruffer exhibited some degree of size reduction in the third molars. Unfortunately, Ruffer did not state in detail what his criterion of "smallness" was.

In Eskimo mandibles examined by Goldstein,[11] four males and two females had peg-shaped molars. In one case, where the right third molar was diminished, the left was "congenitally missing."

TABLE IX. FREQUENCY OF DIMINUTIVE OR PYRAMIDAL THIRD MOLARS IN JAPANESE STUDIED BY TADAO MORI

| | MALES | FEMALES | MALES AND FEMALES |
|---|---|---|---|
| *One or More Third Molars Present:* | | | |
| Total number of individuals | 2,083 | 672 | 2,755 |
| Total number of third molars | 5,940 | 1,476 | 7,416 |
| *Diminished or Pyramidal Third Molars:* | | | |
| Number of individuals | 133 | 28 | 161 |
| Number of third molars | 155 | 32 | 187 |
| Percentage of total number of third molars | 2.60 | 2.16 | 2.52 |

DeTerra[16] also has reported on the reduction in size of third molars among his 500 patients. He made note of only extreme reduction and observed it very frequently in the maxilla. He states further that very often when the third molar on one side was reduced in size the antimere was completely absent.

Tadao Mori,[15] working in Japan, found that 2.60 per cent of the erupted third molars in males and 2.16 per cent in females were markedly reduced in size, as indicated in Table IX. Mori did not find any sex difference in the occurrence of third molars diminished in size. He found 93.58 per cent of the pyramidal third molars in the maxilla and only 6.41 per cent in the mandible.

TABLE X. DISTRIBUTION OF THE LOCATION OF DIMINUTIVE THIRD MOLARS IN JAPANESE* STUDIED BY TADAO MORI

| | NUMBER DIMINUTIVE THIRD MOLARS | PERCENTAGE |
|---|---|---|
| *Maxilla:* | | |
| Right | 81 | 43.31 |
| Left | 94 | 50.27 |
| Total | 175 | 93.58 |
| *Mandible:* | | |
| Right | 5 | 2.67 |
| Left | 7 | 3.74 |
| Total | 12 | 6.41 |
| Total both sides Maxilla and Mandible | 187 | 100.00 |

*Both males and females were included in this study.

The incidence of such teeth was more on the left side of the dentition than the right, as shown in Tables X and XI. These findings agree in the main with my data.

TABLE XI. OCCURRENCE OF DIMINUTIVE THIRD MOLARS IN JAPANESE EXAMINED BY T. MORI

| Distribution of Pyramidal $M_3$'s | W* | W | W W | W W | W | W | W | W W | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| Number of Teeth | 56 | 70 | 24 | 1 | 3 | 6 | 1 | | 161 |
| Percentage | 34.72 | 43.47 | 14.90 | 0.62 | 1.86 | 3.72 | 0.62 | | 100.00 |

*W indicates diminutive or pyramidal teeth.

## DISCUSSION

Although there is a big difference in the number of subjects examined by Goblirsch and the individuals studied at Forsyth Dental Infirmary, there is very little difference in the statistical results obtained. On the other hand, the studies of Hellman, Banks, and DeTerra yielded considerably different results.

The method of collection of data by the last mentioned investigators was quite unsatisfactory. No dental histories were taken and in many cases no x-ray examinations of the dentitions were available. It was observed quite often in the present study that in a few subjects, who had had extraction of first molars at an early age, the second molars had taken up the position of the first molars and the third molars were in the position of the second molars. Unerupted teeth can be studied only with the aid of radiographs, and, if proper attention to such details is not given at the time of collection of the data, the results obtained may be seriously distorted.

An association between the diminution in the size of the third molars and the complete agenesis of third molars is strongly suggested by the analysis of the data. Although the size of the sample in the present series is much smaller than that of Mori, nevertheless, the findings relating to diminutive third molars are in surprisingly close agreement.

## SUMMARY

The incidence of agenesis and diminution in the size of the third molar teeth in a group of 200 young American white women has been described. A

critical review of the literature on the subject indicated a lack of uniformity in the collection of data.

In the present investigation 9 per cent of the individuals examined had agenesis of one or more third molars. Three per cent of them, in addition to having some degree of agenesis of third molars, also showed extreme diminution in the size of some of the third molars present. The greatest tendency toward agenesis was displayed by the maxillary teeth in general and the maxillary right third molars in particular. Likewise, the maxillary third molars displayed a marked tendency to diminution in size. However, third molars which were diminished in size were noticed only in subjects who had agenesis of one or more third molars. This might suggest a causal relationship between the diminution in size and agenesis of third molars, both being influenced by the same or related factors.

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# PROBLEMS IN DENTAL EDITING*

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AFTER a quarter of a century as an editor of dental journals the writer finds that in spite of ever present problems, dental editing, like virtue, is its own reward. The editor of a dental journal is, as a rule, a dentist with a "flair" for writing. He likes to write, is not too gregarious and finds relaxation from his professional endeavors in wading through endless pages of manuscripts, releases, magazines and books with the hope that somehow he will be able to bring to his "deadline" a journal which will contain *something* of interest to most of his readers. He has long given up the hope of publishing a magazine which contains everything of interest to all of his readers.

The president of a certain dental society, on assuming the office, informed the editor that he did not like "The Magazine." In reply, the editor informed the president that the society's publication was not intended primarily to please the president or even the editor himself, but was being published for the benefit and interest of the membership who paid for its publication.

Editors should be mindful of the fact that competition for reader interest is just as keen in dental periodical literature as it is in other fields. If a dentist undertook to read all books, magazines and bulletins published in his professional sphere, he would have little time left for anything else. Brevity, therefore, is an important principle. Moreover, the short paper—like the short speech—requires longer preparation and is usually better constructed and sooner read. However, brevity should not be carried to the point of obscurity. Unintelligible abbreviations and the use of jargon should be avoided in the interest of clarity. The editor should realize that articles are published for the benefit of the readers and not the authors.

It has been said that "the average doctor writes illegibly, spells atrociously, constructs barbaric sentences and paragraphs, and has an uncouth literary style."† Good editors make good authors. There is a need for instruction in dental schools on the writing of scientific articles.

Dental articles fall into two categories. These are 1) basic science articles and 2) technical articles.

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Essay at Conference on Dental Journalism, Chicago, Illinois, June 5, 1953.

*This article, which appeared in the February, 1954, issue of the New York Journal of Dentistry, is reprinted by permission because it is thought to be of great interest to readers of the AMERICAN JOURNAL OF ORTHODONTICS. Probably no department of dentistry includes more writers per number of workers than does orthodontics, and it is thought that this article, written by the editor of the Abstracts and Reviews section of the JOURNAL, will be of considerable interest to our readers.

**Editor, New York Journal of Dentistry.

†Doctors and Books (Editorial), New England J. Med., Feb. 24, 1938.

Basic science articles should be slanted for reader interest. This does not mean that the author should be patronizing and talk down to his readers. The use of charts and graphs should be limited to absolute necessity. The practical application of the subject presented should not be lost sight of, and the discussion and summary should agree with the findings. The author and the editor should realize that highly specialized basic scientific articles are of academic interest to the general practitioner. Dental societies should consider it one of their important functions to subsidize the publication of worthwhile articles in monograph form as supplements to their journals or bulletins. This is done in Europe, notably in the Scandinavian countries.

Technical articles are essentially "how to" articles. They undertake to tell the reader "how to" perform a specific technical procedure. Like scientific articles in general, they should avoid editorializing which has no place in scientific contributions.

They should differentiate between clinical findings and clinical impressions. In describing a technic the author should realize that descriptive terms can emphasize meaning, limit meaning or reverse meaning. A sequential order of presentation should be followed.

Articles presenting original research might follow the following format:

1. Statement of the problem.
2. Historical background and review of previous contributions.
3. Where was the work done; the auspices under which it was performed.
4. Material worked on or with.
5. Tools and instruments used.
6. Method followed—described in such manner as to be reproducible by others.
7. Findings, treatment of data.
8. Discussion.
9. Summary and conclusions.

La Bruyère, the French writer and critic, writing about brevity and clarity said "If you want to say 'It is raining,' say 'It is raining.'" This is a good rule for dental authors to remember and to apply.

There are ethics in authorship which the editor must insist upon. To mention just two, there are the questions of inclusion of bibliographic references and avoidance of personal attacks. Polemics are a thing of the past in scientific literature. Authors should not be allowed to say "It has been said—." The reader has a right to know who said it, and if material is taken from published work it belongs in quotes.

Some editors invite consultants to review articles contributed to their journals. Not unlike other fields, dentistry has its share of men who disagree with everything new, especially if they have not thought of it first themselves. Professional jealousy, chauvinism and downright skulduggery are no strangers among dentists any more than they are elsewhere. The criterion which should

guide consultants in the scientific validity of the article is not whether they agree with its contents. In the last analysis the editor himself should make the final decision whether an article contains anything new; whether it presents known material in a newer, more lucid and more practical manner or whether it presents a review in summary of available information on the subject. Editors should keep in mind that what the reader may have heard before is not necessarily what he presently knows and remembers.

*Illustrations.* Illustrations should not be used simply because the author is willing to pay for them, as is frequently the case in some journals. The criteria for use of illustrations are simple: 1) Does the illustration portray what it is intended to show and 2) would the value of the article be impaired without it. If both answers are in the affirmative, then the illustration should be used.

*Book reviews.* Marston Bates of the Rockefeller Foundation, New York City,* writes of book reviewing as follows: "As it is now, all books on science get about the same treatment, regardless of the audience at which the book is directed. The reviewer will note the inadequate index and faulty documentation, correct these misprints, reprove the author for not citing work published six months before (forgetting the time lag between manuscript and publication, and the cost of changes in proof), and gleefully points out all the howlers he can find. The reviewer may also point out that the book has adequately summarized knowledge in the particular field covered, and note that current ideas have been effectively presented; but these positive values are lost in the catalogue of faults. We rarely try to evaluate a book in terms of how well it has succeeded in attaining its objectives; we are ready to down, but we are cautious with our praise."

A review should contain honest, objective and constructive criticism. It should not be a means for riding a hobby horse. The reviewer should include answers to the following:

1. What is the author undertaking to present?
2. How well is it presented?
3. How does the book compare with others in the field?

*Who should review books.* Authors are not necessarily the best reviewers. Neither are college professors. The use of young men as book reviewers is suggested by Bates. The reviewer should know the field and, what is even more important, he must know how to write.

*Rejection of papers.* Rejection of papers is a trying problem. In the circular letter which is attached to rejected manuscripts by one of the largest publishing firms in Japan is found the following:

"Dear Son: Your writings are masterpieces of technique, and your style is incomparable. Okakura Kazuzo, the greatest of the great, wrote no better. From north to south, from east to west, there is nobody equal to you. Your

*Science, April 18, 1952.

writings are good. Permit us therefore to lay them back in your lap. Kindly continue to be our subscriber and we all beg of you to preserve us your benevolence also in the future."

Different indeed is the message received from Soviet Russia:

"Comrade: We have no use for your miscellanies. Should this induce you to discontinue your subscription with us, we remind you of the disposition of the People's Commissar of Jan. 2, 1932, whereby deliberate damage to the state institutions or Five Year Plan is punished with fifteen years penitentiary or hard labor."—Journal C.D.A.

Somewhere between the above two methods lies the happy medium. Let us hope we can find it.

# Editorial

## Guidance for Orthodontists in Prepayment Plans

ON PAGE 723 of this issue of the JOURNAL are published "Principles for Determining Acceptability for Participation in Public Health and Prepayment Orthodontic Plans by Members of the American Association of Orthodontists" and "A.D.A. Principles for Determining the Acceptability of Dental Prepayment Plans." These principles were submitted to the Board of Directors of the Association by the Committee on Public Health and were adopted by the American Association of Orthodontists at its annual meeting in Chicago on May 19, 1954.

Orthodontists in different parts of the country have been approached by various agencies asking them to help in formulating or to participate in plans for orthodontic care in which the present orthodontist-patient relationship is changed to one in which payment for service is made wholly, or in part, by a third party, usually an agency which undertakes to provide dental and orthodontic care on an insurance or prepaid basis.

The American Association of Orthodontists has shown increasing appreciation in past years of its responsibility in the orthodontic health of the children of the country. This attitude has been voiced by the past presidents of the Association in their presidential addresses. The A.A.O. has instituted a Committee on Public Health which is actively cooperating with public health agencies. Speakers on the public health phase of orthodontics have been appearing on A.A.O. programs with increasing frequency.

The Committee on Public Health of the American Association of Orthodontists has been cooperating for the past two years with the American Public Health Association in the preparation of guides on desirable practices in community health programs for children with cleft lip and cleft palate and those with dentofacial defects. The Public Health Committee in cooperation with a group of consultants, which includes many former presidents of the Association and others with wide experience in orthodontics and public health, have held a number of extended conferences at which the Guides of the American Public Health Association were thoroughly discussed and suggestions for additions, deletions, and changes were made to the American Public Health Association.

It is gratifying to know that the suggestions emanating from the American Association of Orthodontists were adopted almost in their entirety by the Committee on Public Health of the American Public Health Association which is responsible for the preparation of the above mentioned Guides. Moreover,

representatives of the A.A.O. were invited by the American Public Health Association and have served actively in the preparation of these Guides. The Cleft Lip and Cleft Palate Guide of the A.P.H.A. was finally approved by the American Association of Orthodontists at its meeting in Chicago in May, 1954, and the Guide on Dento-Facial Defects will shortly be submitted to the Association for its approval.

Immediate plans for the future work of the Public Health Committee call for a study of orthodontic clinics in the United States. This study will be undertaken with representatives of the sectional societies of the American Association of Orthodontists. The Public Health Committee now includes the following: Oren A. Oliver, L. Bodine Higley, Stephen C. Hopkins, Herbert K. Cooper, and J. A. Salzmann, Chairman. Mention should be made also of the valuable work of two former members of the committee: Dr. B. Holly Broadbent and Dr. Leight C. Fairbank. Members of the Association are invited to communicate with the committee and to make any suggestions to further this work.

*J. A. S.*

## Social Security

WHEN the Senate Finance Committee rejected compulsory Social Security coverage for 3,600,000 farm operators and 500,000 persons in professional fields, that decision makes it possible to permit farmers and professional people to decide themselves whether they want Federal Social Security. The program was set up originally to afford old age and assistance benefits for workers unable or unlikely to provide retirement funds otherwise.

Certainly, most professional men and women are not in this category. If reasonably successful, they can provide privately for their own old-age needs. It might be just as well to let these groups, especially physicians, dentists, lawyers, public accountants and members of similar professional classes, decide whether they want to be included in the Social Security System.

It would be a plausible guess that a majority of farmers and no small number of professional people will elect to come under the program.

The increased benefits, wider expansion in general fields, and other improvements President Eisenhower seeks are more important features of this legislation.

No doubt this decision will receive the approval of most professional men.

*H. C. P.*

# In Memoriam

## WILLIAM MICHAEL PUGH

### 1889-1954

WILLIAM M. PUGH, prominent orthodontist of Wichita, Kansas, died June 10, 1954, after an illness of one week.

Dr. Pugh was born Dec. 1, 1889, at Fall River, Kansas, coming to Wichita in 1898. He received his preprofessional education in the Wichita public schools and graduated from the Kansas City Dental College with a D.D.S. degree in 1918. He was also a graduate of the International School of Orthodontics in Kansas City, Missouri.

WILLIAM MICHAEL PUGH

After serving in World War I in Dental Battalion Number I, Camp Greenleaf, Georgia, Dr. Pugh returned to Wichita in 1919 to take up the practice of Dentistry. He married Avis Needham, who survives.

Organizations which enjoyed and benefited from Dr. Pugh's membership included the Wichita Downtown Kiwanis Club, Wichita Country Club, the Knife and Fork Club, Delta Sigma Delta Fraternity, Omicron Kappa Upsilon, National Honorary Dental Society, the American Association of Orthodontists, the Southwestern Society of Orthodontists, the American Dental Association,

Kansas State Dental Association, the Seventh District Dental Society, and the Wichita Dental Society, of which he was former president. He was a member and past president of the Denver Summer Meeting for the Advancement of Orthodontic Practice and Research, and president-elect of the Southwestern Society of Orthodontists. He was a member of the Catholic Church, attending the Church of the Magdalen.

The sincere sorrow of his widow and many friends may well find consolation in his well-spent life and services rendered.

In the passing of Dr. William M. Fugh we have lost a member whose professional character and accomplishments have reflected the highest honor upon our Society and the dental profession.

He possessed such a delightful personality that it brought him immediate popularity among people he met. He was modest and respected, and possessed that degree of fine fellowship which those who knew him were privileged to enjoy.

# Department of Orthodontic Abstracts and Reviews

Edited by

Dr. J. A. Salzmann, New York City

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

**An Analysis of the Orofacial Structures With Special Reference to Muscle Behaviour and Dental Alignment**: By E. Gwynne-Evans, M.B., B.S.(Lond.). Reprinted (with deletions) from *Speech* **16**: 36, October, 1952.

> "I knew a young lady many years ago, amiable and intelligent; and agreeable in everything excepting the unfortunate derangement and shapes of her teeth; the front ones of which, in the upper jaw, protruding half an inch or more forward of the lower ones, and quite incapable of being covered by the lip, for which there was constant effort; the result of which was a most pitiable expression of the mouth, and constantly of the whole face, with continual embarrassment and unhappiness of the young lady and sympathy of her friends. With all the other charms requisite to have soothed and comforted the life of any man, she lived a life of comparative solitude; . . . after a lapse of thirty years I met her again; and though in her old age she was handsome—her teeth were all gone, and her lips, from the natural sweetness and serenity of her temper, seemed to have returned to their native and childish expression, as if making up for the unnatural and painful servitude they had undergone."
>
> G. Catlin, 1862

Clinical observations of the structural and functional anatomy of the orofacial muscle systems are made by noting

(*a*) the structural form and configuration of the lips and face,
(*b*) the moulding of the lips and facial muscles at rest and in the movements of expression,
(*c*) the behaviour of the lips, cheeks and tongue in feeding and swallowing, and
(*d*) the behaviour of the lips and tongue in the articulation of speech sounds.

Slow motion cine-film records are made for analysis of rapid movements, and for comparing one record with another in different children and in the same child at different times.

Here a broad distinction needs to be drawn between the growth of the skeletal framework of the jaws and the growth of the alveolar portion of the jaws.

The main factors governing the pattern of growth in skeletal bones in general are inherited. Stockard's experiments on the cross-breeding of pure-bred dogs suggest that one set of genes pre-determines the structural pattern of the upper jaw, and another set of genes the structural pattern of the lower

jaw. It may be assumed, therefore, that the growth of the two jaws is independent of each other.

Apart from endocrine influences, environment factors may possibly advance or retard the rate of growth or even prevent fulfillment of the potential growth pattern, but it is doubtful whether the actual structural pattern of the jaws can be altered by any means at our disposal short of surgery.

Alveolar bone, on the other hand, is dependent for its formation on the presence of the teeth. It is built up on the tooth-bearing areas of the jaws as the teeth erupt, and it is absorbed if the teeth are lost. It carries the teeth and responds readily to stresses imposed upon it through the teeth by orthodontic appliances.

The teeth erupt into a receptacle of bone supplied by the jaws which is surrounded by muscles made up by the orbicularis oris, the attendant muscles of facial expression and the buccinators on their external surface, and by the muscles of the tongue on their inner surface.

The general alignment of the teeth and the form of the dental arches as a whole are influenced by the size and the shape of the jaws, and by the constantly recurring muscle forces set up by patterns of movement between the lips, cheeks, and tongue in feeding and swallowing, in facial expression and possibly in speech.

There are, of course, many other factors and local forces around the teeth that influence their path of eruption and their final position in the alveolar bone.

Investigations into the relationship between orofacial behaviour and dental arch form have led to studies of the way the various groups of muscles are organized—

(*a*) to pump and squirt milk into the oral cavity and pharynx in suckling,
(*b*) to create an intra-oral negative pressure in sucking or sipping fluids into the oral cavity before they are transferred to the pharynx by swallowing movements, and
(*c*) to utilize the lips and tongue in a prehensile manner to carry soft and solid food into the oral cavity, and between the teeth for mastication preparatory to the act of swallowing.

In suckling, the lips are pouted to hold the nipple or teat; the upper lip protrudes over the lower lip and envelops the teat, whilst the lower lip supports it and completes the anterior wall of the oral cavity. The lips are lightly sealed round the nipple, but they take no active share in the pumping and squirting of the milk into the pharynx by the tongue and jaw muscles.

In the sipping of fluids, which is accomplished by a series of sucking movements, the lips are firmly sealed round the edges of a cup or spoon; the mandible is lowered and the anterior half of the tongue is depressed away from the hard palate, while the posterior half of the tongue remains heaped up against a depressed soft palate. An intra-oral negative pressure can thus be created to suck fluids into the mouth, which are then transferred to the pharynx by swallowing movements of the tongue and jaw muscles.

In spoon-feeding, the mouth is opened, the tongue is protruded to receive the spoon, and the lips are sealed round the edges to draw food from the spoon into the oral cavity. The lips and cheeks are then, for the first time, actively employed to keep the food in the mouth, whilst the tongue passes it from side to side between the developing gum pads and erupting teeth for mastication preparatory to the act of swallowing.

The upper and lower gum pads of the infant are widely separated at rest. Gradually this vertical space is filled in by the erupting dentitions until there comes a time which varies from child to child when normally at rest, the teeth

are 2-3 mm. apart, and when normally in swallowing, the teeth are held firmly together to seal the walls of the oral cavity and by thus fixing the mandible, to give firm points of origin from which the muscles can act.

Cine-radiographic studies of the act of swallowing, by Ardran and Kemp, have shown clearly that when swallowing commences the tip of the tongue is pressed upwards and forwards against the hard palate and inner surface of the upper alveolus, so that a peristaltic wave of contraction in the body of the tongue squeezes the food backwards—"like tooth paste being pressed from a tube."

In infancy, the orbicularis and buccinator muscles contract to seal the walls of the oral cavity and to prevent the food from being thrust out of the mouth.

When the muscular walls of the oral cavity are replaced by the rigid boundaries of the dental arches and the child learns to keep the food within their inner surfaces, the role of the lips and buccinator muscles is relegated to that of keeping the alveolar buccal sulcus free from deposits of food. Normally, then, the lips are closed in swallowing, but since the teeth are brought together they no longer contract to restrain the forward movement of the tongue. In fact, only when the jaws are held with the teeth just apart in the act of drinking fluids, or in the sucking and swallowing of soft foods such as fruit, are the muscles of the lips and cheeks actively employed.

To the casual observer there is a general uniformity of behaviour from infant to infant and from child to child, but closer observation will reveal individual variations of interest.

In some children a major discrepancy in the anterior-posterior relationship of the jaws may interfere with the sealing of the lips at rest and sometimes in swallowing. In the child whose upper jaw projects well over the lower jaw, the lips are usually apart at rest and the upper incisor teeth are exposed. In the act of swallowing, the lower lip usually contracts under the upper incisor teeth to make firm contact with the lower incisor teeth, and to meet the tip of the tongue which may be thrust forwards over them.

Some children with a normal facial skeleton have a structurally short upper lip. The lips are usually apart and the upper incisor teeth are often exposed. In the act of swallowing, the upper lip often remains inactive, whilst the lower lip contracts and may slip under the upper incisor teeth if they are tilted forwards to any extent.

Many children, however, with normal skeletal and soft tissue structures may also present similar variations of lip behaviour. Rix (1946) has observed that some children do not hold the teeth together in the act of swallowing, and that in these circumstances there is usually a firm contraction of the orbicularis oris, and particularly of the mentalis and zygomatic groups of muscles, to meet the forward thrust of the tongue between the teeth.

The shape of the dental arches and the alignment of the teeth generally correspond to and fit in with the patterns of orofacial behaviour in feeding and swallowing. It is significant, too, that the dental patterns usually correspond also with the patterns of behaviour in facial expression and sometimes in the articulation of speech sounds.

When the teeth are together in swallowing and the lips are closed with no, or only very slight, contraction of the orbicularis oris and attendant facial muscles, the occlusal relationship of the teeth is usually found to be normal, providing that other prerequisites for a normal occlusion are also present. In these cases, the lower lip constantly plays over the upper incisor teeth and meets the upper lip in facial expression and in speech.

When the teeth are not together in swallowing and the lower lip, aided by the mentalis and zygomatic muscles, forms a firm anterior wall to meet the

forward thrust of the tongue between the separated teeth, the occlusal relationship of the teeth is often found to be abnormal even when other prerequisites for a normal occlusion are present. The labial segment of the upper dental arch is usually tilted forwards, and the labial segment of the lower dental arch is often tilted backwards to varying degrees in different cases. It is to be seen, also, that the lower lip contracts firmly against the lower incisor teeth and often fails to cover the upper incisor teeth to a greater or lesser extent in facial expression and in speech. Sometimes a space will remain between the upper and lower incisor teeth even when the molar teeth are brought together, a condition known as open bite. In such a case, the tip of the tongue may be placed between the teeth in the articulation of "s" sounds, but this may not always occur even with a marked open bite.

It is not usual for children to be brought for examination until dental deformities are well established.

Apart from the fact that the teeth, when the alignment of the dental structures has been corrected by orthodontic appliances, the behaviour pattern of the orofacial muscles in swallowing and in facial expression remains more or less unchanged, and the new dental alignment is liable to relapse to its original state if steps are not taken to retain the new positioning of the teeth in the alveolar bone by orthodontic means for some considerable time.

If it can be assumed, therefore, that as the teeth erupt they are carried in the alveolar bone to a position of equilibrium within the forces of their muscular environment, a better understanding of the origin and life history of adverse patterns of behaviour is of paramount importance to the orthodontist.

Rix (1946) was the first observer to point out that a number of dental abnormalities seemed to be related to persistent infantile patterns of swallowing behaviour.

Gwynne-Evans (1948) followed up the observations made by Rix describing the processes of maturation as they affect the feeding and breathing mechanisms, along the lines used by Gesell on the development of the child. Later (1951), through the work of Negus, he traced the evolutionary changes that take place in the feeding and breathing mechanisms from fish to man.

In the course of this work it was realized that the orofacial muscles occupy a functional position between the somatic and visceral systems. They appear to behave in some activities like somatic or skeletal muscles and in others as visceral muscles.

Speaking in general terms, somatic or skeletal muscles are grouped together under the control of the higher centres in the central nervous system; they contract rapidly and their behaviour is capable of becoming differentiated to a high degree. Visceral muscles, on the other hand, are under the control of the autonomic nervous system; they are largely concerned with the vegetative functions of life; they respond slowly, usually in peristaltic waves and their behaviour does not become highly differentiated.

A continuous band of muscles surrounds the mouth and upper part of the pharynx; the deeper layers of the orbicularis oris decussate with the fibres of the buccinators which, through the pterygomandibular raphe on either side, are continuous with the superior constrictor muscle of the pharynx.

In suckling, the transfer of milk from the teat is directed continuously through the mouth to the pharynx and is effected by an automatic peristaltic or visceral type of behaviour in the tongue and mylohyoid muscles. A rhythmical pumping and squirting activity is set up which is subserved by simple contractions of the jaw muscles. The soft palate is actively tensed and depressed against the posterior part of the dorsal surface of the tongue, leaving

the nasopharyngeal airway open. The milk passes between the faucial pillars and the lateral margins of the tongue into the lateral food channels of the pharynx on either side of the laryngeal aperture, which is protected from inundation by the upraised margins on the epiglottis and aryepiglottic folds. The lips only hold the teat, whilst the lower lip together with the buccinators merely provide the walls of the oral cavity. They are not actively employed in the suckling process. As the nasopharyngeal and laryngeal airways remain open and nasal breathing is continuous it is presumed that the fibres of the superior constrictor are relatively inactive.

In sipping or in drinking fluids, a similar visceral type of behaviour in the tongue and mylohyoid muscles occurs, but in this case peristaltic waves are deliberately initiated in rapid succession to pass the fluids to the pharynx, which is also subject to a series of peristaltic waves that commence in the superior constrictor to close off the nasopharynx with the help of the elevators of the soft palate before they pass down the length of the pharynx. In the swallowing of soft or solid foods, a single wave of contraction in the tongue and mylohyoid muscles is voluntarily initiated to effect transfer of the food from the mouth to the pharynx, and this is followed immediately by a wave of contraction first in the superior constrictor to close off the nasopharynx, and then in the middle and inferior constrictors to squeeze the food downwards into the oesophagus. In the transference of both fluids and solids from the mouth to the gullet, the nasopharynx is momentarily closed to prevent the inundation of the air passages.

With some children the teeth are together in swallowing and the lips, although closed, are not actively employed in the swallowing process.

With other children, the teeth are not together in swallowing; it would seem that the visceral type of behaviour in the tongue and mylohyoid muscles includes the orbicularis oris, mentalis, zygomatic and buccinator muscles in a peristaltic wave that is initiated in the lips and passes backwards through the mouth to the pharynx. The meeting of the lower lip with a forward thrust of the tongue between the separated teeth is a marked feature of this pattern of behaviour.

Originally, it was thought that this latter type of behaviour in swallowing was merely an infantile pattern that would, in time, merge into the former pattern of behaviour during the normal process of maturation. Clinical experience, however, has not borne this out.

Remembering that the orofacial muscles occupy a functional position between the somatic and visceral types of behaviour, it would seem that some children emphasize the latter in their swallowing movements more than others. The two types of behaviour are so frequently seen that it is difficult to say which is normal and which is abnormal. It would be tempting to refer to the one as the "somatic type" and to the other as the "visceral type," but for the present it is safer merely to recognize them and to say that one is often associated with a normal occlusion and the other with an abnormal occlusion between the teeth.

The facial muscles of the infant are impassive and expressionless. The lips may, or may not, be in contact; nasal breathing is not dependent on lip closure, but on the co-aptation of the soft palate with the posterior part of the dorsal surface of the tongue.

One of the earliest expressive reactions of the infant is the cry, but at first, the orofacial muscles are involved as a whole without special expressive movements. As the organization of the central nervous system advances and the influence of the cerebral cortex is brought into play, the total reflex be-

haviour of the musculature is gradually inhibited in favour of individual movements of the face, lips, and tongue that come to express an ever-increasing variety of emotional feelings and the growing intellect.

The movements of the face, lips, and tongue are rapidly executed, and as the intellect advances they become more and more highly differentiated.

The play of the attendant muscles of facial expression on the orbicularis oris reshapes the infant mouth, and the pouting character of lip behaviour gradually gives way to patterns of behaviour in which the corners of the lips are drawn backwards and upwards.

The habitual facial expression of some children seems to ensure lip closure at rest and to reflect an active mental attitude from an early stage in life.

The habitual facial expression of other children does not appear to allow lip closure at rest except by conscious effort. Their impassive facial muscles, parted lips and open mouth, often give the impression of a vacant mental attitude which, in the past, has been attributed to dullness of intellect secondary to adenoid overgrowth and nasal obstruction.

Investigations have shown that a low intelligence level among these latter children is the exception rather than the rule; the adenoids are by no means always enlarged or causing nasal obstruction; the open mouth is not necessarily indicative of mouth-breathing, which only supervenes when the tongue is away from the soft palate and, finally, the persistence of the open mouth and the vacant facial expression into adult life is rarely seen.

Inadequate degrees of muscle tone were once thought to be directly responsible for parted lips and an open mouth at rest, but they are more likely just part of the general behaviour pattern of the orofacial muscles that reflects the disposition of the child.

It is not that a child cannot keep his mouth and lips closed at will, but that there are times when he does not choose to use the orofacial muscles as he should. Perhaps some children need to practise their facial accomplishments and in particular, lip closure. At any rate, through the slow and steady progress of maturation and with training most children can be taught to keep the lips closed at rest as an habitual pattern of behaviour, unless there is some structural defect such as a short upper lip, or an overjet of the upper teeth or jaw which would make lip closure difficult to achieve without constant effort.

Many children who contract the mentalis, zygomatic, and buccinator groups of muscles in their swallowing behaviour also emphasize their contraction in facial expression and, to some extent, in speech. Expressive patterns, however, take time to develop fully and their influence, if any, on the alignment of the dental structures may often be delayed.

Speech patterns are acquired and are based on innate patterns of behaviour employed in feeding and in facial expression. Functional abnormalities of speech behaviour are therefore capable of being corrected to a large extent, but how far it may be possible to overcome adverse elements of orofacial behaviour in swallowing and in facial expression is not yet known.

So far, it seems possible only to obviate their effects on the alignment of the teeth until the patient is old enough to modify them if only partially, by conscious adaptations of behaviour which by frequent practice become firmly fixed as acquired habits. If this were not possible, orthodontic treatment in many cases might, in the end, be of no avail.

# News and Notes

## American Association of Orthodontists
## 1955 Annual Meeting

We on the Pacific Coast already have pleasant thoughts of cordially greeting all of you at next year's meeting of our association, May 8 through 12, 1955, in our ideal convention city, San Francisco.

We hope you have started to think of it also, and to make plans to come to our beautiful California, the vacation land of America. Whether it will be your first visit or your return to scenes of fond memories, we know you will enjoy yourselves.

We have big plans under way for you, from both an educational and a recreational standpoint. Our scientific program is already complete with an array of the nation's top clinicians and essayists. Need we tell you that there is plenty to do and see in our beautiful city? You will be hearing from us regularly, so watch for our announcements.

*Reuben L. Blake,* General Chairman.

*Walton Jones, Louisville, Ky.*

Joseph E. Johnson, D.D.S., of Louisville, Kentucky, who has been chosen to receive the Ketcham Award for 1954-55. The award will be presented at the annual meeting of the American Association of Orthodontists in San Francisco next May.

## Installation of New A.A.O. Officers

Installation of Officers of the American Association of Orthodontists in Chicago, Illinois, May, 1954.

*Left to right:* Franklin Squires, White Plains, New York, Secretary-Treasurer. Philip Adams, Boston, Massachusetts, President Elect. George Herbert, St. Louis, Missouri, Vice-President. Fred West, San Francisco, California, President. James Ford, Chicago, Illinois, Immediate Past-President.

(Photograph by Dr. E. N. Bach.)

## Golden Anniversary Luncheon

Dr. Lloyd S. Lourie of California speaking at the Golden Anniversary Luncheon of the American Association of Orthodontists in Chicago, Illinois, May, 1954. Dr. Lourie is the only living charter member and at the same time a past-president of the A.A.O.

*Left to right:* B. E. Lischer, Dr. Lourie, Charles R. Baker, and Leuman Waugh.

(Photograph by Dr. E. N. Bach.)

## Principles for Determining Acceptability for Participation in Public Health and Prepayment Orthodontic Plans by Members of the American Association of Orthodontists

The following principles were adopted by the American Association of Orthodontists at the annual meeting in Chicago on May 19, 1954. These principles are intended as a guide to practitioners of orthodontics who contemplate participation in Public Health orthodontic programs and prepayment dental service plans which include orthodontic care:

All programs and plans should

1. Be compatible with the Code of Ethics of the American Dental Association and with the Code of Ethics of the American Association of Orthodontists.
2. Be compatible with the American Dental Association's "Principles for Determining the Acceptability of Dental Prepayment Plans" (1953).
3. Not be conducted for profit by a third party.
4. Be compatible with authoritatively accepted public health procedure.
5. Foster, encourage, and provide a high quality of orthodontic care.
6. Be made available for participation to members of the American Association of Orthodontists and to other members of the American Dental Association who give acceptable evidence of proficiency in orthodontic practice.
7. Type and severity of malocclusion to be treated should be determined by an Orthodontic Advisory Group consisting of members of the American Association of Orthodontists and preferably of certificants of the American Board of Orthodontics.

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## American Dental Association
## Principles for Determining the Acceptibility of Dental Prepayment Plans

The following statement was adopted by the House of Delegates of the American Dental Association, in September, 1953.

1. The plan should be developed, maintained, and promoted to the public with the advice of authorized representatives of the local or state dental society.

2. The plan should foster and encourage the provision of a high quality of dental treatment. If local conditions and lack of facilities make it necessary that restrictions be placed on the extent and types of treatment, such restrictions should be determined and regulated by authorized representatives of the dental profession. No other group is educationally equipped to exercise such control.

3. The dentist who serves the patient must have complete freedom and responsibility in recommending treatment as his own professional judgment dictates.

4. The patient must have freedom to choose the dentist to whom he may wish to apply for treatment. Similarly, the dentist must have the right to accept patients who apply for treatment. In order to safeguard this freedom of choice, the dental care plan should not contain rules or regulations to exclude ethical and legally qualified dentists from participation in the plan.

5. The plan should make provision for direct payment to the dentist.

6. All rules and policies that are related to the dental aspects of the plan, including examination, diagnosis, treatment, prevention, and professional education, should be determined by officially designated representatives of the dental profession.

7. Fees for dental services paid to dentists under the plan should be determined by authorized representatives of the dentists who will render the dental services. In all cases, payments should be consistent with the provision of high-grade dental service.

8. The plan should designate explicitly both the type and amount of service and the conditions under which it will be provided so that both the patient and the dentist will know exactly the extent of their participation in the program.

9. Sound and efficient business practices should be used in the management of the plan in order to assure low administrative cost.

## Central Section of the American Association of Orthodontists

The Central Section of the American Association of Orthodontists will hold its next meeting Oct. 4 and 5, 1954, at the Park Plaza Hotel, St. Louis, Missouri.

## Northeastern Society of Orthodontists

The Fall Meeting of the Northeastern Society of Orthodontists will be held at the Hotel Statler, Buffalo, New York, on Oct. 25 and 26, 1954.

## Pacific Coast Society of Orthodontists*

Northern component meets second Tuesday of March, June, September, and December.

Central component meets second Tuesday of March, June, September, and December.

Southern component meets second Friday of March, June, September, and December.

OFFICERS

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| President | Arnold E. Stoller, Seattle, Wash. |
| President-Elect | A. Frank Heimlich, Santa Barbara, Calif. |
| Vice-President | Vernon L. Hunt, Eureka, Calif. |
| Secretary-Treasurer | Raymond M. Curtner, San Francisco, Calif. |

NORTHERN COMPONENT

No meeting.

CENTRAL COMPONENT

Regular meeting at the Alexander Hamilton Hotel on June 8, Chairman Wendell Wylie calling the meeting to order at 8:30 P.M. and entertaining a motion that the minutes of the last meeting be accepted as published in the *Bulletin*. Norman Snyder seconded the motion, which was carried.

The guest speaker for the evening was Dr. Reed Holdaway of Provo, Utah, who presented a paper based on clinical material as assessed cephalometrically. He dealt specifically with the problem of convex faces and pointed out that flexible standards governing incisor inclinations should be adopted rather than rigidly defining the relationship between these teeth and the Frankfort plane. He offered a set of measurements which can be readily derived from a lateral headfilm, by which treatment planning can be facilitated, and a table suggesting the modification of incisor inclination in accordance with apical base relationships. Clinical records, including photographs, plaster models, cephalometre tracings, and intra-oral x-rays of a number of patients, were displayed by Dr. Holdaway before the meeting.

A.A.O. President, Fred West, announced that the A.A.O. meeting would be held in San Francisco May 8-12, 1955, and urged all present to cooperate to present an outstanding meeting. He introduced George Hahn as Program Chairman, which should speak for itself as to the quality of the program. Those of us who know George know that anything he is associated with is difficult to surpass.

Reuben Blake was introduced as General Chairman, who reported on the Chicago Meeting and told of progress of our next year's meeting to date.

With the program in the hands of George Hahn as Chairman, you may be assured it will be an outstanding one. After starting on its arrangement long ago, George reports that it is now complete with such top essayists as Holly Broadbent, William Downs,

*Reprinted from the Bulletin of the Pacific Coast Society of Orthodontists.

Charles Tweed, Spencer Atkinson and a symposium panel composed of Ken Terwilliger with three other experts in their fields.

Hotel arrangements at the Fairmont are now complete and your President and his capable "executive committee" at this writing are selecting the large Local Arrangements Committee. We are sure that if you are called upon to do a job, you will respond willingly.

It will be the first time the A.A.O. has held its meeting in San Francisco and the second time on the Pacific Coast (Hollywood in 1938), so here is our chance to show our colleagues throughout the nation that we know how. In Chicago, we pledged ourselves to present the finest meeting ever held, so surely we must make good on that promise. Remember that each and every one of us will be a host to our visitors, so we know you will all get behind President Fred and his committee to give them a meeting they will never forget.

Present at the Chicago meeting were: George Barker, Reuben Blake, Ray Brownell, Lloyd Chapman, Arthur Corbett, Ted Engdahl, David England, Carl Engstrom, Arthur Everett, Aldys Gray, George Hahn, A. F. Heimlich, A. C. Heimlich, Vernon Hunt, Everett Hunt, Paul Husted, Howard Jan, Ernest Johnson, Dallas McCauley, Alton Moore, Robert Ricketts, Arnold Stoller, Everett Watkins, Fred West, Robert Whitney, and Wendell Wylie. From "south of the border," Mexico, came Dr. Ferrera and Samuel Fastlicht.

SOUTHERN COMPONENT

Our meeting was called to order by Chairman Herbert Shannon, June 11, 1954, in the Nikabob Restaurant.

Roscoe Keedy, Program Chairman, introduced Cecil Steiner who spoke on "Cephalometrics in Every Day Orthodontic Practice." Because cephalometrics is here to stay, it is his belief that all orthodontists should be familiar with and use cephalometric x-rays. His method of diagnosis uses seventeen measurements and gives the relative information he is most interested in obtaining.

After the social hour and dinner, Cecil Steiner continued his paper. Numerous cephalometric drawings showing before treatment, after treatment, and after retention with photographs and relative descriptive material were shown by slide and placed on display.

A table filled with all types of occipital and cervical gear from the earliest in his practice to his latest, which he calls directional headgear, was presented.

NORTHERN COMPONENT

Since our membership is not large, we have contented ourselves with attending other section meetings and seminars and have delayed our usual June meeting.

Five of the men attended the Fiftieth Annual Session of the American Association of Orthodontists in Chicago this May. Alton W. Moore of Seattle presented a paper on "Facial Growth and Its Clinical Importance in Orthodontics." Herm Dahl and Bill McGovern from Tacoma presented case reports and papers that would certify them as members of the A.B.O. Also in attendance were Lloyd Chapman of Vancouver, B.C., and Arnie Stoller of Seattle.

## Southern Society of Orthodontists

The Southern Society of Orthodontists will hold its next annual meeting in Washington, D. C., Oct. 31 through Nov. 3, 1954, at the Mayflower Hotel.

## Southwestern Society of Orthodontists

The Southwestern Society of Orthodontists will hold its next meeting Oct. 10 through Oct. 13, 1954, at the Skirvin Hotel, Oklahoma City, Oklahoma.

## American Board of Orthodontics

The next meeting of The American Board of Orthodontics will be held at the Fairmont Hotel in San Francisco, California, May 3 through May 7, 1955. Orthodontists who desire to be certified by the Board may obtain application blanks from the secretary, Dr. C. Edward Martinek, 661 Fisher Bldg., Detroit 2, Michigan.

Applications for acceptance at the San Francisco meeting, leading to stipulation of examination requirement for the following year, must be filed before March 1, 1955. To be eligible, an applicant must have been an active member of the American Association of Orthodontists for at least three years.

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## American Association for Cleft Palate Rehabilitation

The American Association for Cleft Palate Rehabilitation will hold its annual meeting May 13 and 14, 1955, in Boston, Massachusetts.

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## The American Institute of Dental Medicine

The next Annual Meeting of the Institute will take place at the Desert Inn, Palm Springs, California, Oct. 31 to Nov. 4, 1954. The faculty will consist of the following.

*William A. Albrecht, Ph.D., University of Missouri, Columbia, Missouri:* Soil and Nutrition. I. Evidence from Soil Exploitation. II. Services from Soil Treatments; "Let Rocks Their Silence"; Droughts. The Soils as Reasons for Them.

*Charles H. Best, M.D., D.Sc., University of Toronto, Toronto, Canada:* The History and Action of Insulin; Recent Work on Carbohydrate and Fat Metabolism; Dietary Factors in the Protection of Liver, Kidneys, and Heart.

*Gordon M. Fitzgerald, D.D.S., University of California, San Francisco, California:* X-ray Radiation, Its Dynamics and Management; Radiation Protection Planning for the Dental Office; Practical Roentgenographic Interpretation in Dental Medicine.

*Maynard K. Hine, D.D.S., Indiana University, Indianapolis, Indiana:* Principles of the Treatment of Periodontal Disease; Oral Microbiology; Diseases of the Tongue and Other Oral Lesions.

*Ernest Jawetz, Ph.D., M.D., University of California, San Francisco, California:* The Rational Use of Antimicrobial Agents: Reason versus Emotion in Chemotherapy; Virus Infections of Interest to the Dentist and Therapeutic Approaches; The Rise and Fall of Focal Infection.

*Joseph P. Weinmann, M.D., University of Illinois, Chicago, Illinois:* The Adaptation of the Periodontal Membrane to Physiologic and Pathologic Changes; Bone Formation and Bone Resorption; Variations in the Structures of Bone Tissue and Their Significance in Radiology.

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## Temple University

Temple University of Philadelphia, Pennsylvania, has announced a two-week course in orthodontics for practicing orthodontists under R. H. W. Strang, D.D.S., Jan. 23, 1955, to Feb. 5, 1955.

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## The Denver Summer Meeting for the Advancement of Orthodontic Practice and Research

The Denver Summer Meeting for the Advancement of Orthodontic Practice and Research (formerly the Denver Summer Seminar) held its seventeenth annual meeting at the Park Lane Hotel, Denver, Colorado, Aug. 1 through 6, 1954.

Something new in the way of programs was arranged. Among other things, a symposium with William Roy Humphrey, D.D.S., as moderator was held under the general title of "Possibilities and Limitations of Orthodontic Treatment and Growth." The entire membership participated in the discussion. The following are some of the points discussed.

1. How much bodily movement can be given any tooth?
2. Are molars ever moved bodily distally, and do they remain there?
3. What changes occur in the correction of Class II cases? Is there a major difference between those of Class II, Division 1 and Division 2?
4. Is the lower arch necessarily permanently disturbed with intermaxillary elastics?
5. What effect has growth on the correction of anteroposterior dysplasias?
6. Consequently how is age correlated with the necessity for extraction?
7. How is the temporomandibular joint connected to malocclusion and its correction?
8. Can the mandible be repositioned?
9. What is the meaning of rest?
10. How does the direction of growth affect prognosis?
11. When is the greatest change in the growth of the face?
12. What similarities and differences exist between appliances?

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## Notes of Interest

Edward C. King, D.D.S., announces that Robert W. Baker, D.D.S., M.S., is now associated with him in the practice of orthodontics in the Seneca Bldg., Ithaca, New York.

Dr. Leonard Middleman announces that his office is now located at 453 New York Ave., Huntington, Long Island, New York, practice limited to orthodontics.

Quentin M. Ringenberg, D.D.S., M.S., announces his return from active duty with the United States Air Force and the reopening of his office for the practice of orthodontics, Suite 240, Beaumont Medical Bldg., 3720 Washington Ave., St. Louis, Missouri.

W. B. Stevenson, D.D.S., and Bill Stevenson, Jr., D.D.S., wish to announce the removal of their offices to the Professional Bldg., 610 West 8th St., Amarillo, Texas, practice limited to orthodontics.

Howard E. Strange, D.D.S., wishes to announce that after July 1, 1954, he will devote full time to his practice at his office, 1912 West 103rd St., Chicago, Illinois, with Francis J. Hanagan, D.D.S., as a part-time associate, practice limited to orthodontics.

Lyman E. Wagers, D.M.D., announces the removal of his office to 227 Harrison Ave., Lexington, Kentucky, practice limited to orthodontics.

Dr. Howard Yost announces the association of Dr. R. H. Donley in practice limited to orthodontics, 803 West Division St., Grand Island, Neb.

## OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and the following component societies. The editorial board of the AMERICAN JOURNAL OF ORTHODONTICS is composed of a representative of each one of the component societies of the American Association of Orthodontists.

### American Association of Orthodontists

*President,* Frederick T. West - - - - - - - - 760 Market St., San Francisco, Calif.
*President-Elect,* Philip E. Adams - - - - - - - 106 Marlborough St., Boston, Mass.
*Vice-President,* George H. Herbert - - - - - - - 7002 Pershing Ave., St. Louis, Mo.
*Secretary-Treasurer,* Franklin A. Squires - - - - - Medical Centre, White Plains, N. Y.

### Central Section of the American Association of Orthodontists

*President,* Earl E. Shepard - - - - - - - - - 8230 Forsyth Blvd., St. Louis, Mo.
*President-Elect,* Howard Yost - - - - - - - - - - - - - - - Grand Island, Neb.
*Secretary-Treasurer,* Frederick B. Lehman - - - - - - - 1126 Merchants Bank Bldg., Cedar Rapids, Iowa

### Great Lakes Society of Orthodontists

*President,* Louis Braun - - - - - - - - 1601 David Whitney Bldg., Detroit, Mich.
*Vice-President,* Richard C. Beatty - - - - - - - - Hanna Bldg., Cleveland, Ohio
*Secretary,* Hunter I. Miller - - - - - - - 1416 Mott Foundation Bldg., Flint, Mich.
*Treasurer,* George S. Harris - - - - - - - - 18520 Grand River Ave., Detroit, Mich.

### Middle Atlantic Society of Orthodontists

*President,* Raymond C. Sheridan - - - - - 59 S. Orange Ave., South Orange, N. J.
*Secretary-Treasurer,* Gerard A. Devlin - - - - - - - 49 Bleeker St., Newark, N. J.

### Northeastern Society of Orthodontists

*President,* Philip E. Adams - - - - - - - - 170 Marlborough St., Boston, Mass.
*Secretary-Treasurer,* Wilbur J. Prezzano - - - - - Medical Centre, White Plains, N. Y.

### Pacific Coast Society of Orthodontists

*President,* Arnold E. Stoller - - - - - - - - Medical Dental Bldg., Seattle, Wash.
*Secretary-Treasurer,* Raymond M. Curtner - - - - - 450 Sutter St., San Francisco, Calif.

### Rocky Mountain Society of Orthodontists

*President,* Don V. Benkendorf - - - - - - - - Metropolitan Bldg., Denver, Colo.
*Vice-President,* Walter K. Appel - - - - - - - 4018 Moore Ave., Cheyenne, Wyo.
*Secretary-Treasurer,* Curtis L. Benight - - - - - - 1001 Republic Bldg., Denver, Colo.

### Southern Society of Orthodontists

*President,* Leigh C. Fairbank - - - - - - - 1726 Eye St., N.W., Washington, D. C.
*Secretary-Treasurer,* M. D. Edwards - - - - - - 132 Adams Ave., Montgomery, Ala.

### Southwestern Society of Orthodontists

*President,* Marion A. Flesher - - - - - Medical Arts Bldg., Oklahoma City, Okla.
*President-Elect,* William N. Pugh - - - - - Union Natl. Bank Bldg., Wichita, Kan.
*Vice-President,* Ott Voight - - - - - - - - - Medical Arts Bldg., Houston, Texas
*Secretary-Treasurer,* Fred A. Boyd - - - - - - 1502 North Third St., Abilene, Texas

### American Board of Orthodontics

*President,* Raymond L. Webster - - - - - - - 133 Waterman St., Providence, R. I.
*Vice-President,* Ernest L. Johnson - - - - - - - 450 Sutter St., San Francisco, Calif.
*Secretary,* G. Edward Martinek - - - - - - - - 661 Fisher Bldg., Detroit 2, Mich.
*Treasurer,* Lowrie J. Porter - - - - - - - - 41 East 57th St., New York, N. Y.
*Director,* William R. Humphrey - - - - - - - - - Republic Bldg., Denver, Colo.
*Director,* L. Bodine Higley - - - - - University of North Carolina, Chapel Hill, N. C.
*Director,* Wendell L. Wylie - - - - University of California, San Francisco, Calif.